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PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES,
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

EDITED BY

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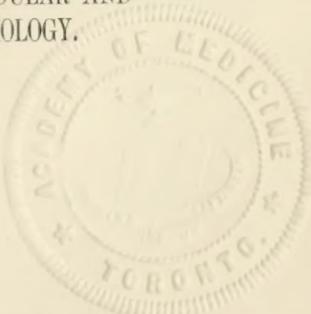
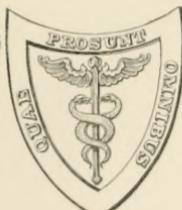
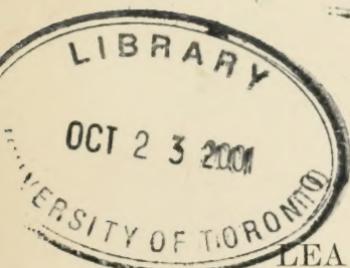
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VOLUME II. JUNE, 1900.

SURGERY OF THE ABDOMEN, INCLUDING HERNIA—GYNECOLOGY—
DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC
DISEASES. DISEASES OF THE GLANDULAR AND
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PROGRESSIVE MEDICINE.

JUNE, 1900.

SURGERY OF THE ABDOMEN, INCLUDING HERNIA.

By WILLIAM B. COLEY, M.D.

SURGERY OF THE STOMACH.

Gastrophtosis. Several operations have been performed for the relief of patients suffering from downward displacement of the stomach, or gastrophtosis. This condition is usually associated with dilatation of the stomach, and often with the displacement downward of the intestines and kidneys, giving a general splanchnoptosis, or Glenard's disease, as it is sometimes called. Dilatation of the stomach due to pyloric thickening or spasm was formerly treated by a plastic operation upon the pylorus, but is now considered an indication for gastro-enterostomy, the results of this method of treatment having been very satisfactory.

Cases of gastric dilatation uncomplicated by pyloric difficulty or by a sinking of the whole organ are rare. Such a condition has been successfully met by infolding the anterior wall of the stomach, so as to diminish its calibre and make it easier for the muscular organ to empty itself. Such implication can be accomplished in various ways, by taking a single row of sutures or several rows, by taking a single tuck in the wall, or several tucks, etc. If carefully performed the operation entails very little risk, and in suitable cases the results are good. Bircher,¹ Brandt,² Ewart and Bennett,³ Faure⁴ and others have relieved patients in this way.

Though the number of these operations has been too small to warrant generalizations, yet the clinical result has been, almost without exception, a permanent relief from many of the distressing symptoms. Wins-

¹ Correspondenz-Blatt f. Schweizer Aerzte, 1891, p. 713.

² Centralblatt f. Chirurgie, 1894, p. 361.

³ Lancet, 1896, vol. ii., p. 8.

⁴ Gazette des Hôpitaux, 1897, p. 242.

low¹ has very recently reported the case of a physician who had suffered for twenty-five years with dyspepsia, which at times was so severe as to prevent him from following his occupation. Before operation the greater curvature of the stomach reached to the brim of the pelvis. Hydrochloric acid was absent. The greater curvature was sutured to the lesser curvature by two rows of silk suture, thus reducing the size of the stomach one-half. Although the patient still suffered somewhat from indigestion, his symptoms were ameliorated; the stomach emptied itself completely, and free hydrochloric acid again became present in the gastric juice, showing that the functional activity of the peptic glands was restored.

Gastric implication may be advantageously combined with gastro-enterostomy in cases of great gastric dilatation due to pyloric stenosis. Indeed, this was the condition under which one of the earliest implications was performed.²

Gastric dilatation without pyloric stenosis is due to a lack of tone in the abdominal organs, and hence it is almost invariably associated with sinking of the whole stomach; or the gastropexis may exist without dilatation. Obviously implication or gastro-enterostomy will not fulfil the requirements in such cases. It is interesting to notice some of the means which have been resorted to by surgeons to bring the sagging stomach back into position.

In 1895 Treves³ found the liver and stomach abnormally low, and held in that false position by omental adhesions about a mass of tuberculous glands. This mass was excised, the liver lifted up into its normal position and held there by stitches passed through the falciform and round ligaments and the fibrous tissues of the abdominal wall at the sides of the xiphoid cartilage. By this operation almost constant abdominal pain and frequent vomiting were permanently relieved.

In 1896 Duret⁴ operated upon a woman, aged fifty-one years, in whom the lower border of the stomach came within four fingers' breadth of the pubis. Stitches were passed through the lesser curvature and anterior surface of the stomach, and the organ suspended from the peritoneum of the anterior abdominal wall. The patient was relieved of her gastric distress and at once began to recover her lost weight.

In 1897 Davis⁵ operated with success upon two patients in whom the intestines as well as the stomach were displaced downward. According to him, this is a common association of lesions. "If the lesser curvature is found half-way or more from the ensiform cartilage to the umbilicus, no doubt can exist that ptosis not only of the stomach, but of the

¹ Philadelphia Medical Journal, 1900, vol. v., p. 291.

² Weir. New York Medical Journal, 1892, vol. lvi., p. 29.

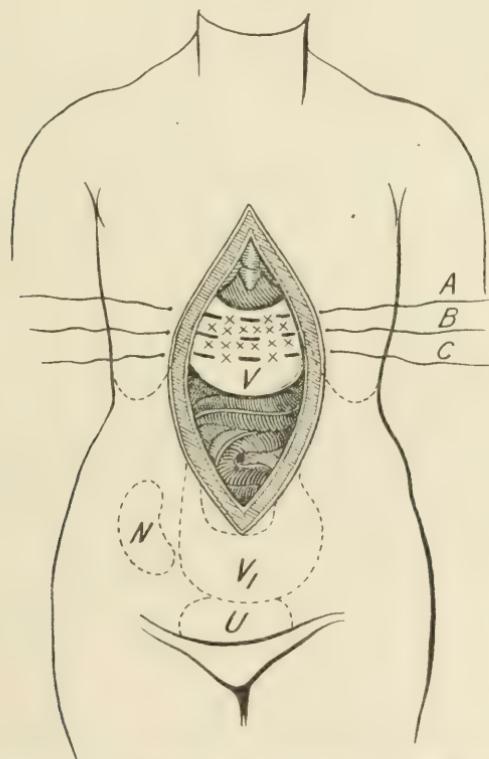
³ British Medical Journal, 1896, i., p. 1. ⁴ Revue de Chirurgie, 1896, p. 421.

⁵ Western Medical Review, 1897, p. 291.

intestines is present.' The stomach was lifted into its normal position by stitches passed through the lesser omentum and the parietal peritoneum near the ensiform cartilage, and the intestines were raised by a reef taken in the mesentery, each stitch being carefully inserted between the arteries, so that the circulation of the intestine was not interfered with, although the intestine was lifted at least two inches by the reef.

In January, 1898, Rovsing¹ operated upon a woman, the lesser curvature of whose stomach was an inch below the umbilicus. She had all

FIG. 1.



Rovsing's operation for gastropexy. *V*. Stomach. *V₁*. Position of the stomach before operation. *U*. Urinary bladder. *N*. Right kidney. *a, b, c*. Silk sutures. *e, e*. Scarifications.

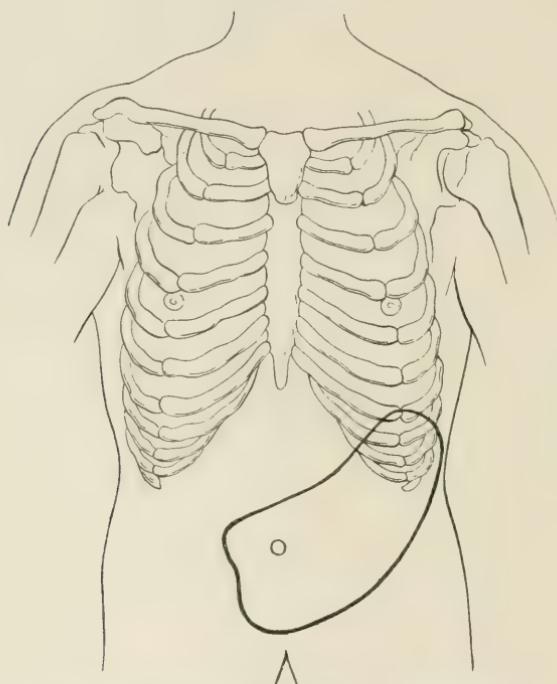
the symptoms of gastropexy, including a loss in weight of twenty-five pounds. The stomach was fastened in its proper position by three stout silk sutures passed through the whole thickness of the abdominal wall and through the outer coats of the stomach in three or four places, so that 6 cm. (2.5 inches) of the anterior wall of the stomach were brought

¹ Archiv für klinische Chirurgie, 1900, vol. Ix., p. 812.

into contact with the parietal peritoneum. To make the union firmer the visceral peritoneum was scarified in many places between the sutures. These points are clearly shown in the diagram (Fig. 1).

The result in this case was excellent. Six months later the patient had gained over forty pounds in weight, and except for a certain amount of constipation, she was in perfect health. Examination showed the stomach to be still in its normal position. The floating kidney had in the meantime been sutured. Rovsing afterward performed the same operation with equal success upon two other patients suffering from gastrophtosis.

FIG. 2.



Position of stomach before operation. (BEYEAL's case.)

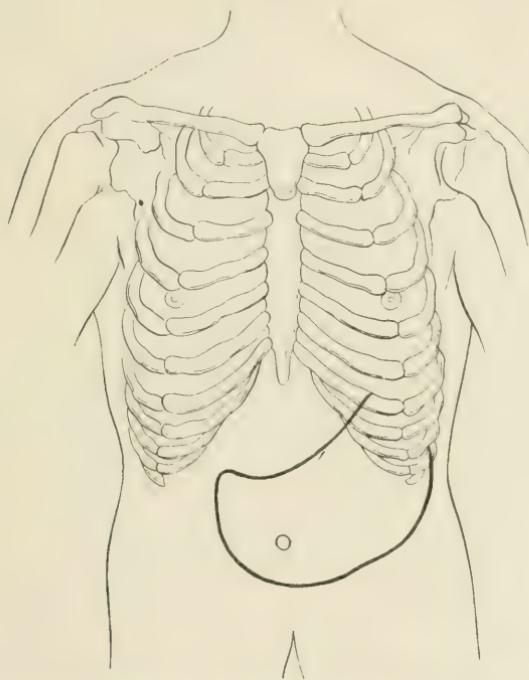
In April, 1898, Beyea¹ operated upon a patient whose stomach occupied the position indicated in Fig. 2. The patient was placed upon an inclined plane, with her shoulders higher than her pelvis, in order to stretch the supporting ligaments of the stomach and facilitate suturing. Tucks were taken in the gastrophrenic and the gastrohepatic ligaments by the insertion in each of eight or ten interrupted sutures, and in order to make the adhesions broader a second row of stitches was passed from

¹ American Journal of the Medical Sciences, 1899, vol. cxvii., p. 266.

the ligament below the first line of sutures to the under surface of the parietal peritoneum. The patient was much relieved, and in the six months following operation there was a gain of ten pounds in weight, although the stomach was raised only so that "the greater curvature did not extend more than an inch and a half below the umbilicus." (Fig. 3).

In October, 1898, Hartmann¹ performed a combined gatroplication and gastropexy upon an emaciated and cachectic woman whose stomach was displaced and dilated, especially in its pyloric portion. After the

FIG. 3.



Position of stomach six months after operation. (BEYEA's case.)

organ had been folded in upon itself it was elevated and sutured to the anterior abdominal wall. Three weeks after operation inflation of the stomach showed it to be in a normal position, and under careful feeding the patient gained in weight about thirty pounds in three months.

The rapid improvement in the condition of these patients and the enormous gain in weight after operation is certainly sufficient recommendation of operative attempts of this character. One other fact stands out prominently, and that is the disastrous effect of long-continued gas-

¹ Terrier et Hartmann. *Chirurgie de l'Estomac*, Paris, 1899, p. 343.

troptosis upon the general condition of the patient. Rovsing¹ mentions an instance in which a patient was reduced in weight from 140 to 56 pounds as a result of gastrophtosis without pyloric stenosis or dilatation of the stomach. It was his intention to perform upon this patient the same operation which gave him success in three previous cases, but she collapsed upon the table, and gastrojejunostomy was hastily done. The woman recovered from the operation, and during the succeeding month gained two pounds in weight, but later gradually sank, and died six weeks after the operation, apparently of inanition as no lesion other than the gastrophtosis was found at the autopsy. There is every reason to believe that had this patient been operated upon earlier by a suitable method she might have completely recovered.

Gastrotomy as a means of extracting foreign bodies is a well-known operation, with an unfortunate death-rate (6 deaths in 35 cases since the introduction of antisepsis). As a means of arresting hemorrhage it is little known, but nine cases having been reported,² the mortality being 67 per cent. Since some patients recover from gastric hemorrhage even after death seems inevitable, this is not an encouraging record. The difficulty in exposing quickly the ulcer is partly overcome by a method of turning the stomach inside out, proposed by Savariaud³ and described by Terrier and Hartmann in their book on the surgery of the stomach, from which Fig. 4 is taken.

By passing the four fingers into the lesser peritoneal cavity behind the stomach all the movable portions of the organ can be everted through the opening made by a transverse incision in the anterior surface 8 or 10 cm. (3 or 4 inches) long. In this manner the anterior and posterior walls and the lesser and greater curvatures can be quickly passed under the eye. Most of the cardiae end can be seen by holding the stomach open by retractors, the upper one of which, not too broad and very long, lifts up the left lobe of the liver at the same time that it opens the gastric wound.

As a means of diagnosis and for treating gastric hemorrhage this procedure should be known to all abdominal surgeons, although it is yet too soon to speak of its possibilities or to compare its results with those of gastro-enterostomy or those of medical treatment.

Operations for Gastric Ulcer and for Perforation. Operation may be performed as a means of cure of gastric ulcer or to relieve the patient from some of its complications, notably perforation, hemorrhage, and stenosis with dilatation. The logical order in which to consider the

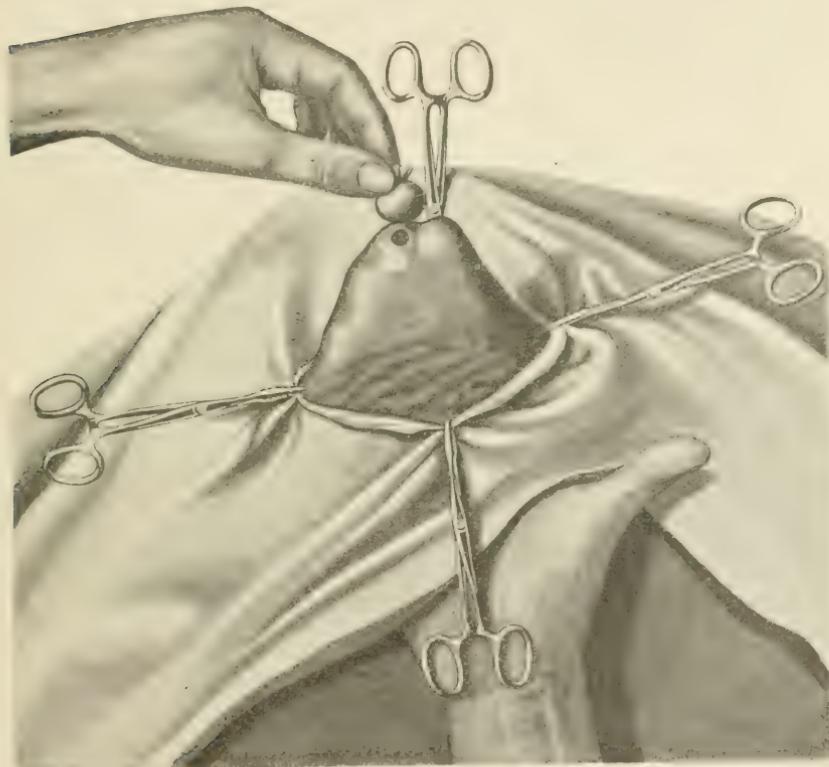
¹ Archiv f. klinische Chirurgie, 1900, vol. **IX.**, p. 812.

² Dienlafoy. Bull. Acad. Med., Paris, 1898, p. 49, and Duplay. Bull. Acad. Med., Paris, 1898, p. 90.

³ De l'ulcère hém. de l'estomac, etc., Paris, Steinheil, 1898.

divisions of the subject is that here given, but in point of time treatment began with perforation, and has been so recently applied to the other complications and to the ulceration itself that there is still very little to be said about it. There is always hope that a patient may recover from hemorrhage and be cured of other gastric symptoms due to ulceration by medical measures; but perforation is a complication which is universally recognized as leading to almost certain death in a

FIG. 4.



The four clamps hold back the four angles of the incision in the stomach. The fingers of the right hand, passed through an opening in the mesocolon, are turning the stomach wrong side out. (TERRIER and HARTMANN.)

few hours unless the hole in the stomach is closed by suture. Hence, in spite of the difficulties attending its diagnosis and treatment, attempts at surgical cure were made as long ago as 1880. None was successful, however, until 1892, and for some years afterward only a few successful results were published. In 1896 Weir and Foote¹ were able to collect only 78 cases, reports of which had appeared up to that time in Ameri-

¹ Medical News, 1896, vol. Ixviii., pp. 149 and 181.

can and European journals. In 1898 Keen and Tinker¹ added 78 other cases reported in the intervening two years, and in 1899 Tinker² collected and published 76 additional reports of operations performed within a year. These figures are interesting as showing how rapidly the treatment of a complication which has been known for centuries has been altered by the publication of the success of surgical interference.

Nationality. By adding together the figures in these three tables Tinker finds that the nationality of the patients was as follows:

In England and its colonies	150 cases.
“ Germany	29 “
“ United States	22 “
“ France	21 “
“ Sweden	3 “
“ Denmark	3 “
“ Norway	2 “
“ Italy	2 “
 Total	 232 cases.

Sex. More than five-sixths of the cases occurred in women.

Age. Of the female patients more than three-fifths were under twenty-five years of age; while less than one-twelfth of the males were under twenty-five years of age, and one-third of them were over forty years of age.

Previous History. In nearly all of the cases there was a history of previous gastric catarrh, although some patients were attacked suddenly while apparently in perfect health.

Site of Perforation. All the tables agree in showing that perforation of the stomach occurs most frequently in the anterior wall, and more often near the cardiac than the pyloric end. Perforation in the lesser curvature is more common than in the greater. Perforation in the posterior wall appears only a few times in the reports, but this may be merely because it does not always lead to operation.

Failure to Find Perforation. In the 78 cases occurring before 1896 the operator failed to find the perforation 16 times; in the second series of 78 cases, most of which occurred from 1896 to 1898, the operator failed to find the perforation 9 times; while in the 76 cases since 1898 failure to find the perforation was only 4 times recorded.

Diagnosis. The diagnosis of perforation is based upon:

1. The history of the disease; and
2. The occurrence of sudden very severe pain in the epigastrium or left hypochondrium.

These diagnostic points were mentioned in almost every instance.

¹ New York Medical Journal, 1898, vol. lxvii., pp. 776 and 809.

² Philadelphia Medical Journal, 1900, vol. v., p. 251.

Vomiting was a frequent symptom, and collapse was present in many cases.

The symptoms of peritonitis appear within a few hours after perforation takes place. In almost all cases in which operation was delayed for fifteen hours after perforation there was abdominal distention. Often it was present much earlier.

Before distention occurs the abdomen is frequently retracted and very rigid. When distention comes on it is rigid and tympanitic, usually with absence of liver dulness, and respiration is of the costal type. Tenderness is almost always present. The pulse is usually rapid, and the temperature begins to rise about twenty-four hours after the infection—a sure sign of general peritonitis.

If one first sees the patient after peritonitis has developed diagnosis may be very difficult. It is well to remember that the pain is in the left upper quadrant, while that of appendicitis, together with the rigidity, are in the right lower quadrant. Moreover, in gastric ulcer with perforation fecal vomiting is wanting—a point which may serve to distinguish it from intestinal obstruction. The rule should be to open the abdomen when such threatening symptoms arise, even if a positive diagnosis cannot be made.

Treatment. Tinker advocates an incision parallel to the left costal margin if the diagnosis is certain; otherwise a median incision. At all events it should be long enough to give a good exposure of the diseased parts. The ulcer should not be excised, but closed with two rows of Halsted's sutures. If the stomach wall is too friable for suture an omental graft may be sutured over the perforation, or a tube and gauze may be used for drainage and to protect the rest of the peritoneal cavity.

If the patient's condition permits, a search should be made for other ulcers, which are present, according to Orth, in 20 per cent. of the cases. Indeed, in several instances a second ulcer, by hemorrhage or perforation, has produced the death of the patient. Hence, Turner and also Jones have advised breaking through into the lesser omental cavity in every instance, in order to make sure that a perforation has not taken place into it.

The suture of the perforation does not complete the operation, and there yet remains the more difficult task of cleansing the whole abdominal cavity. Some surgeons have advised that the peritoneum be wiped with sterile gauze, but Tinker, following the practice of the large majority of those who have reported successful cases, flushes the abdomen with large quantities of hot water or hot salt solution. In order to be effectual this part of the treatment must be carried out with thoroughness, and every pocket in the whole peritoneal cavity must be washed clean. Particular attention should be given to the space between the diaphragm

and the liver, and to the pelvis. The median incision will probably have to be extended below the umbilicus, and other incisions in the lumbar regions may be required. These supplementary openings should be utilized for drains, either of glass or of gauze, or of both. Whatever theoretical arguments may be advanced against this plan of treatment of the peritoneal cavity, it still remains true that most of the patients who recovered were irrigated and drained, and one cannot escape the conviction in reading the histories that some of those who died without drainage might have been saved had drains been employed.

The patient should take nothing but boiled water by the mouth for five or seven days, being sustained meanwhile by rectal enemata. In every case the patient should remain in bed for a long time and should receive a course of treatment calculated to cure the ulceration of the stomach, of which the perforation was merely a complication.

Mortality. The most recent statistics show a much better percentage of recovery than do the earlier ones. Thus the mortality for the whole series of operations—232 cases—is 42.67 per cent. For the operations performed before 1896 it is 63.36 per cent., and for those since 1896 it is only 35.71 per cent.—a reduction of pretty nearly one-half.

The most important factor in determining whether the patient whose perforation has been sutured will recover or die is the length of time which elapsed between the hour of perforation and that of suture. This point was emphasized in a table by Weir and Foote, and stands out with just as much prominence in later tables. The following table, reproduced from Tinker's article, shows the mortality for different groups of patients, separated according to the length of elapsed time:

Time between perforation and operation.	Total operations.	Died.	Recover'd.	Percentage of mortality.
Less than twelve hours	68	17	51	25.
Twelve to twenty-four hours	50	27	23	54.
Twenty four to forty-eight hours	35	25	10	71.42
More than forty-eight hours	40	21	19	52.5
Interval not mentioned	39	19	20	—
	232	109	123	46.98

But that the better results which surgeons have obtained in the last three years are not wholly due to the fact that they are on the alert for cases of perforation, and operate upon them more promptly than formerly, is shown by a comparison of the cases operated upon after a less than twelve-hour interval previous to 1896 and since that time. Before 1896 the mortality of early operation was 36.67 per cent., whereas since that time it has been only 16.21 per cent.—a reduction in mortality of more than one-half.

Convalescence. The figures of life and death do not tell the whole story of the difference between the effects of early and late operation; for while recovery after an early operation is usually uneventful, some of the patients who were operated upon late have finally regained their strength only after protracted illnesses, which brought them more than once to the edge of the grave. Lennander's¹ words on this subject are worth repeating:

"The first essential in order to save a large number of patients suffering with severe abdominal symptoms is, that we physicians cease to believe that it is our first duty in these cases to relieve pain. On the contrary, we should, from the character of the pain, form a diagnosis, the important part of which is, 'in this case we should operate immediately' or 'in this case we should not operate, at least not immediately.' If we begin with a large dose of morphine or with hot compresses we delude the patients with hope, which, in the majority of cases, rapidly disappears when the distention of the abdomen denotes the presence of a diffuse peritonitis."

Maurice Richardson² says that the percentages of recoveries as it appears in collections of published cases is, in his opinion, too high, because men shrink from publishing their fatal cases. Up to the present time some ten patients with perforation of gastric ulcer have been operated on at the Massachusetts General Hospital, and only one of them recovered. It is only fair to state that in no case was the operation performed in less than twenty-four hours after the perforation. The prognosis under such circumstances is the prognosis of operations in the presence of fully established peritonitis, and a high mortality is to be expected.

"The prognosis depends upon many things, but chiefly upon the nature and extent of the infection. The so-called fulminating peritonitis is rather dependent upon the amount and rapidity of the extravasated material than upon the virulence of it; rather upon the rapid and abundant escape of infectious fluids than upon the wide reproduction of virulent germ-colonies spreading from a limited focus throughout broad areas; a sudden overwhelming of the abdominal cavity rather than a spreading invasion. In the one case the peritoneal cavity is immediately flooded to its remotest areas; in the other it is infected coil by coil. I have seen such flooding in large perforations of the appendix close to a cæcum distended with fluid contents; in the sudden rupture of ulcers through distended intestinal walls, and in perforations of well-filled stomachs; in all, the onset of peritonitis is the same, and it may

¹ Mittheil. Grengeb. Medecin und Chirurgie, 1898, vol. iv., p. 91.

² Philadelphia Medical Journal, 1900, vol. v.

well be called fulminating, for but a few seconds are necessary to flood the furthest confines of the abdominal cavity.

"In many cases, especially those in which the extravasation takes place slowly, adhesions rapidly form which limit more or less the contaminating flow. They especially protect those areas of the peritoneum which are anatomically more or less isolated—the lower half from the upper by the transverse colon and its mesentery; the one half from the other by the mass of intestines and their mesentery; the general peritoneal cavity from the pelvis by gravitation, intestines, and so on. These adhesions present but a feeble barrier, but one which may be strengthened by successive additions before a slowly advancing extravasation. This may explain how twelve patients, in whom the symptoms left no doubt of the existence of a perforation of the stomach, recovered without operation."

Of diagnosis Richardson says: "With a definite history of gastric ulcer the diagnosis is easy. Unaided by any history of gastric ulcer, and dependent upon the immediate symptoms alone, a strong probability of perforation can usually be established; yet in one instance, personally reported to me by the surgeon, two teachers in clinical medicine, with the surgeon himself, regarded the lesion as an acute appendicitis. I might mention many acute abdominal lesions in which I have been entirely mistaken as to the exact disease. Sudden pain in the epigastrium, radiating to the back, the shoulder, or even to the groin, suggest an infection in the upper areas of the peritoneal cavity. Occurring in women of early adult life, a perforated stomach-ulcer is strongly suggested. With the symptoms of peritonitis—tenderness, rigidity, obstipation, vomiting, shock—the probability becomes almost a certainty; with evidence of free gas the conclusion is almost irresistible. When to these symptoms are added a clear history of gastric ulcer, but one conclusion is possible. And yet the diagnosis may be wrong. Indeed, the wider his experience the more strongly is the surgeon impressed by the difficulties of diagnosis and the more charitable does he become in judging the mistakes of others. Though he is frequently impressed by the difficulties of interpreting the cause of symptoms, he is equally impressed by the clear necessity for intervention."

Although pain is the most important symptom, yet pain alone, even in a patient who has had a gastric ulcer, does not justify operation. To the pain there must be added the symptoms of peritoneal shock—*i. e.*, elevation of the pulse, normal or depressed temperature, rigidity of muscles, and tenderness. Unless this precaution is observed the surgeon may open the abdomen for a simple colic.

Richardson prefers the median incision in all obscure symptoms of the upper abdomen, because it permits examination of stomach, gall-

bladder, pancreas, spleen, and kidneys. The peritoneum will be forced into the wound by whatever gas or fluid makes up the extravasation. Gas and intestinal contents indicate perforation of the alimentary tract; blood, rupture or injury of the pancreas; pus, a ruptured abscess; turbid serum, beginning peritonitis; simple serum, almost any lesion, acute or chronic; and bile, a ruptured gall-bladder. The organ thus indicated should be examined at once, no time being lost in general examinations.

When a perforation is found the first thing to do is to stop further extravasation; the second, to remove fluids already escaped; and the third, to annul as perfectly as possible the injury already done the peritoneum and to provide against an advancing peritonitis. Most patients are in a condition that demands the simplest and most rapid methods of closure—methods in which security must be sacrificed to speed, suturing to gauze drainage, careful cleansing to brief irrigation. The patient who survives hasty efforts at repair is better off than he who succumbs after the slow fitting of a perfect joint. The folly of applying ideal operations to desperate cases has been too frequently illustrated by deaths on the table.

As more than half of the reported operations for gastric perforation have been performed by British surgeons, an article from one of them upon this subject ought to contain many points of interest. A recent paper by Bidwell¹ fulfills these anticipations. After emphasizing the importance of operating without delay, he says that because of the shock always present in these cases, special precautions are necessary to minimize the shock of the operation itself. The patient should be kept warm upon a hot-water table, or by hot bottles, and the limbs should be incased in warmed cotton-wool and flannel bandages. A brandy enema or the intravenous injection of two or three pints of normal salt solution are often necessary. He prefers an incision in the left semi-lunar line. The edges of the perforation should not be pared, but simply invaginated, while the rent is closed by Lembert or Halsted sutures, generally in two rows. His views on irrigation and drainage are closely in accord with those of Tinker, except that he does not drain through lumbar incisions, but places a strip of gauze and a rubber tube in the operative wound, and in case the extravasated fluids have reached the pelvis he makes a second opening for drainage above the pubes and inserts a glass tube into Douglas' fossa.

Sometimes, although the signs of perforation are well marked, no extravasation is found in the general peritoneal cavity. It should then be shut off by sponges while the lesser cavity is opened by tearing through the gastro-colic omentum. If no extravasation is found the

¹ American Journal of the Medical Sciences, 1899, vol. cxviii.

perforation has either not taken place or adhesions are sufficiently strong to prevent extravasation. If extravasation has taken place the perforation must be found and sutured and the lesser cavity irrigated, special care being taken to see that the pockets around the liver are well washed.

When adhesions form before perforation takes place, communication may be established between the stomach and the colon, or the pericardium, or the small intestine, or an abscess may form. According to the site of the perforation the abscess may lie between the stomach and the under surface of the liver, passing thence upward between the liver and diaphragm, or it may lie between the stomach and anterior surfaces of the duodenum and pancreas, finally coming to the surface between the stomach and colon or passing upward and perforating into the thorax. If one of these abscesses causes an abdominal swelling it had best be opened high up in the median line and drained with a tube. Some surgeons have advocated irrigation, but it entails the risk of breaking down adhesions and opening the general peritoneal cavity. If there is no abdominal swelling, but dulness over the left lower costal region, the eighth and ninth ribs should be resected and the abscess drained through the diaphragm after the diaphragmatic and costal pleurae have been sutured to prevent infection of the pleural cavity.

HEMORRHAGE. Bidwell has also something to say about the surgical treatment of gastric hemorrhage. Operation for this purpose has not been performed many times. He was able to collect only twenty-one cases in which operation was performed, and the mortality was 62 per cent. Although hemorrhage occurs in from 30 to 45 per cent. of all cases of gastric ulcer, only a small number of these patients require operation, either because the repeated hemorrhages are so slight or because the larger losses of blood are so infrequent. But if operation is to be performed at all it should not be delayed until the patient is exsanguinated.

Of the several operations which have been performed for hemorrhage, excision is not now generally attempted on account of its high mortality—three deaths in four operations (Mikulicz). The application of a purse-string suture around the ulcer, without excision, is a safer procedure. The stomach should first be opened and emptied of its contents. If the base of the ulcer is found to be non-adherent, a purse-string suture should be applied to constrict it; if it is adherent it should not be disturbed, but gastro-enterostomy should be carried out. A discouraging feature of operation for hemorrhage is the possibility that the ulcer cannot be found. An ulcer which has given rise to fatal hemorrhage may be so shallow that it is not easily found even at autopsy. If the ulcer involves the pylorus, or if there is any tendency to gastric

dilatation as a result of present or previous ulceration, gastro-enterostomy should be performed to give complete rest to the stomach. Pyloroplasty and pylorectomy have been successfully performed for ulcer, but they are too severe operations in themselves to be recommended as methods of cure.

STENOSIS AND DILATATION. Operation may be required in a third series of cases of gastric ulcer, namely, those in which medical means are unavailing or in which there is pyloric obstruction, resulting in dilatation. Olivier says that an ulcer of the stomach, even though not situated at the pylorus, interferes with the passage of food through the pylorus, since the abnormal acidity so often present in ulcer sets up pyloric spasm. The four operations mentioned for relief of these conditions are gastro-enterostomy, pyloroplasty, pylorectomy, and Loretta's operation. The last named is not satisfactory, and pylorectomy is too dangerous, so that the choice lies between gastro-enterostomy and pyloroplasty. Each has its advocates, and it is perhaps yet too soon to say which will become finally recognized as preferable. The mortality of pyloroplasty thus far is about 14.5 per cent., while that from gastro-enterostomy in benign conditions is variously given at from 6 to 16 per cent. The technique of gastro-enterostomy has been much improved in recent years, and the mortality from its performance in the future is likely to be considerably lower than it has been in the past.

Surgical Treatment of Unperforated Gastric Ulcer. Gilford¹ says that the experience of the past ten years has shown that many patients suffering from gastric perforation may be saved by a timely operation; and it has also shown that, as most of the deaths under such circumstances have been due to the perforation and not to opening the abdomen, the wise course to pursue is to anticipate perforation and operate at leisure. In certain cases of gastric ulcer there is a special liability to hemorrhage and perforation from the outset; and clinical signs will usually enable one to tell whether a given case is dangerous or benign. The mortality of the former class is about 18 per cent.

But there are strong reasons against operation in uncomplicated gastric ulcer. The ulcer is sometimes hard to find, either because it is out of reach of the finger or is very small. There may be multiple ulcers. Vomited blood may come from a ruptured varicose, œsophageal or gastric vein or a miliary aneurism.

When the ulcer is found its treatment is by no means simple. Excision and suture may give rise to a great deal of hemorrhage and shock; and retching may be so severe after an otherwise successful operation as to produce the death of the patient.² A still more potent

¹ Guy's Hospital Reports, 1898, vol. liii., p. 103.

² Gilford. Loc. cit.

factor against operation is the firm belief which most physicians hold, that almost all patients suffering from gastric ulcer recover. This view is directly contrary to statistics of hospital cases at least, which show a mortality of nearly 20 per cent. from perforation, hemorrhage, or exhaustion.

Indications for operation may be comprised in three groups, as follows :

1. Severe and typical symptoms (pain, hemorrhage, and vomiting) unrelieved by prolonged treatment in bed, or recurring again and again after apparent cure.

2. Bleeding which resists all medical treatment and continues to such an extent as to be dangerous to life, and then only (*a*) when there have been previous symptoms of ulceration, or (*b*) when the hemorrhage is recurrent and cannot be controlled and the patient has reached such a state of anaemia that further bleeding will probably be fatal.

3. Acute ulcers complicated with certain effects of ulceration which are in themselves painful or dangerous, viz., adhesions, severe hour-glass contraction causing stenosis, pyloric obstruction, or marked dilatation.

Gilford operated three times upon non-perforated ulcers. In one instance the attacks of pain were so severe that it seemed probable that perforation had taken place. The ulcer was readily found in the anterior wall of the stomach. It was excised and two rows of sutures were inserted. After continuous uncontrollable retching the patient died in thirty-two hours. Everything was found in good condition at autopsy, and the author suggests the inclusion of a branch of the vagus nerve in the suture as a possible cause for the retching.

In his second case operation was performed for hemorrhage. The ulcer could not be found, but at autopsy, ten days later, a large ulcer was found in the posterior wall, the pancreas forming its base.

In his third case, beside fresh ulcers, there was a marked stenosis of the stomach from cicatricial contraction and a subphrenic pouch due to perforation. The stenosis was divided longitudinally and sutured transversely. The patient recovered from the operation and returned home in sixteen days. One month after operation she was taken suddenly ill and died of hemorrhage. The autopsy showed that a portion of the wound in the stomach where the cicatrix had been the thickest was still unhealed and had given rise to the fatal hemorrhage.

This last case is an excellent illustration of the evils of postponing operation until a late period. It also shows how very important it is to keep such a patient in bed and on a strict diet for weeks after operation.

Operations on the Stomach for Non-malignant Troubles. In this connection it is worth while to consider the opinions recently published

by Peterson,¹ who has worked with Czerny and is thoroughly familiar with the results of their very numerous operations upon the stomach performed at the Heidelberg clinic.

The indications for operation in non-malignant gastric difficulties are either absolute or relative.

I. Absolute indications: Pyloric stenosis with mechanical insufficiency of a marked degree (constant decrease in the amount of urine and body weight).

II. Relative indications—that is, those which arise after the failure of internal remedies :

1. Atonic mechanical insufficiency of a marked degree.
2. Dangerous hemorrhage.
3. Severe gastralgias and continuous vomiting (whether due to a fresh ulcer, or to a cicatrix, or to perigastritis, or to adhesions).

In considering the advisability of operation one wishes to know, first, its mortality, and, second, its effects upon the patients who live through it. Peterson's paper was based upon 76 operations performed in one hospital since 1882. In this number are included 5 excisions of the ulcer, with 1 death; 4 resections of the pylorus, with 2 deaths; 8 pyloroplasties, with 1 death; 45 gastro-enterostomies, with 4 deaths; and single instances of less well-known procedures. There were 8 deaths attributable to the 76 operations, a mortality of 11 per cent. Seven of these deaths occurred before 1896. Since that time there have been 44 operations, with only 1 death, giving a mortality of only 2.3 per cent. This remarkable decrease in mortality is explained by Peterson as due to :

1. The good condition of patients when they come for operation.
2. A wider experience in operative technique, and, above all, the avoidance of extensive excision or resection.
3. A shortening of operations made possible by practice, but chiefly by the introduction of Murphy's button. The danger of collapse or pneumonia is very slight when an operation lasts fifteen minutes only. Moreover, the button allows of immediate nourishment by the stomach and prevents the stasis of fluids in the afferent loop of bowel, with closure of the efferent bowel, uncontrollable vomiting, and death—a sequence which was formerly so much to be dreaded.

If the mortality of an operation is the first point of interest in regard to it, the permanent results which it produces are equally worth the surgeon's attention. Peterson finds that the results obtained by operations in Czerny's clinic in the past few years are better than those previously obtained. This is partly due to the improvements in technique spoken

¹ Deutsche medicinische Wochenschrift, 1899, pp. 387 and 403.

of above, but still more to the choice of operation. The three conditions requiring operative treatment are stenosis, hemorrhage, and gastralgia.

FOR STENOSIS OF THE PYLORUS, circular resection was four times carried out. Two patients died of the operation, one nine months later of recurrence of the stenosis, and a fourth was cured.

The ulcer causing the stenosis was four times resected. One patient died of hemorrhage; one died nine months later of duodenal perforation, and two recovered.

These operations were then abandoned, and upon eight patients a pyloroplasty was performed. One of them died; a second died in nine months, of recurrence; in a third there remained such a lack of motor power that gastro-enterostomy was advised; a fourth suffered still from gastralgia, although the motor power of the stomach was good; while the condition of four patients was improved.

Pyloroplasty was once looked upon as a sovereign remedy. Peterson now considers it contraindicated if there are extensive pyloric adhesions or a hardness of the pylorus with a greatly dilated stomach, if marked hyperacidity is present, or an open ulcer. If his conclusions are accepted the field of this operation is limited and is being occupied more and more by gastro-enterostomy.

Gastro-enterostomy was performed 37 times, with 4 deaths. Two other patients died in a short time of intercurrent diseases, and 1 ten weeks after operation of a sudden hemorrhage from gastric ulcer. This is the only instance in which hemorrhage followed a gastro-enterostomy. Two patients died of carcinoma developing in the pyloric stenosis, although this was thought at operation to be benign. In three instances the motor power of the stomach remained unsatisfactory, while the pains were only partially overcome. The remaining 25 patients (67 per cent. of those operated upon) were fully restored to health, 2 of them after the performance of a second operation to enlarge the anastomotic opening. The cause of the contraction was in one case not clear. In the other there was a distinct compression of the intestinal loop at the point where it passed through the transverse mesocolon (posterior gastro-enterostomy), the operator having neglected to stitch the meson to the posterior wall of the stomach.

FOR GASTRALGIA. Seven patients were operated upon without a death. Four times gastro-enterostomy was performed with success. Once separation of adhesions in the neighborhood of the gall-bladder relieved the pain. A pyloroplasty failed to relieve the pain and necessitated gastro-enterostomy nine months later. This was successful. Partial excision and cauterization of a large ulcer did not entirely cure the patient, who was under treatment at the time of report.

FOR HEMORRHAGE. Two patients were cured by gastro-enterostomy, combined in one instance with partial excision of the ulcer. In a third, gastro-enterostomy failed to stop the hemorrhage, which very likely came not from an ulcer of the stomach, but from the parenchyma—an example of vicarious menstruation.

A patient suffering from gastric atony without pyloric stenosis was completely relieved by gastro-enterostomy.

The effects of gastro-enterostomy are thus described :

1. The dilatation of the stomach disappears, at first rapidly, then more slowly. The stomach rarely returns to its normal size.
2. In most cases the stomach quickly regains entirely its motor power. In some cases this takes considerable time, and in a few it is only regained in part.

3. The clinical conditions after gastro-enterostomy are these : The amount of free hydrochloric acid almost invariably falls at once. If there was hyperacidity before the operation this is overcome; if the hydrochloric acid existed in normal or lessened degree it usually disappears entirely. Only rarely is there an increase of hydrochloric acid. Lactic acid also disappears. Neither the disappearance of hydrochloric acid nor the presence of bile (which is often found in the stomach after gastro-enterostomy) causes any unpleasant symptom.

Statistics of Gastro-enterostomy. The most recent complete statistics of gastro-enterostomy are those of Mayo Robson,¹ in his lectures on "Surgery of the Stomach." His table contains 1978 cases, of which 1258 recovered and 720 died, a mortality of 36.4 per cent. Inasmuch as some of these cases are reports of individual surgeons and others of large collections of cases, a considerable number have undoubtedly been counted twice. Haberkant gives a mortality, in gastro-enterostomy for cancer, of 43.5 per cent., while in gastro-enterostomy for ulcer he estimates it at 25.5 per cent. At Czerny's clinic Petersen said that in simple cases the mortality prior to 1895 was 25 per cent., while since 1895 it has been only 3 per cent.

From a recent communication from Dr. J. B. Murphy, of Chicago, I am able to give his latest statistics of operations in which the Murphy button has been employed. Of 575 gastro-enterostomies results were reported in 417. Of these 76 per cent. recovered and 24 per cent. died. Of 550 cases of entero-enterostomy results were reported in 542 cases, with a mortality of 23.4 per cent. Of 142 cases of cholecystenterostomy the mortality was 14.08 per cent. In these statistics the malignant as well as the non-malignant are included, the former making up a large percentage of the mortality, especially in the case

of cholecystenterostomy. In one case only was death attributable to the button.

APPENDICITIS.

The subject of appendicitis has received even greater attention from surgical writers during the past year than ever before. In spite of the rapidly increasing literature, it cannot be said that the most important question of "when to operate" has yet been definitely settled.

By far the most important paper that has been contributed during the past year on the subject of appendicitis is that of Dr. Maurice H. Richardson, of Boston, read before the American Surgical Association, May, 1899. Combining an operative experience in appendicitis greater than that of any other surgeon in the world, and a reputation for sound judgment, his conclusions should carry great weight.

In attempting to answer the two questions, "Should every case be operated upon as soon as diagnosis is made?" and "Should the appendix be removed in every case?" he says: "As a rule, the appendix should be removed if the diagnosis is made in the first hours of the attack. After the early hours operation is advisable in the following cases: First, if the symptoms are severe and especially if they are increasing in severity. Second, if the symptoms, after marked improvement, recur. Third, if the symptoms, though moderate, do not improve.

"The wisdom of operation is questionable (1) in severe cases in which peritonitis is successfully localized and the patient is improving; (2) in cases which are at a critical stage and which would not successfully undergo the slightest shock."

His answer to the second question, as to whether the appendix should be removed in every case, is that it should not be removed in localized abscess with firm walls. "(3) When the patient's strength does not permit prolonged search. It should be removed whenever the peritoneal cavity is opened, unless the patient's condition forbids. It should also be removed in all cases as soon as the inflammatory process has had time to completely subside (two or three months after the attack). In cases of simple drainage the scar tissue should be excised, the appendix removed, and the wound securely sutured."

Richardson emphasizes the point that appendicitis is a surgical disease; that it should be admitted to surgical rather than medical wards. He believes that there are certain cases and certain times when no course of treatment seems too radical and others when none too conservative. He quotes the statement that a series of nineteen consecutive deaths after operation in acute appendicitis, which it is said actually occurred, may well suggest the query whether it were not better to abandon the hard-

and-fast rule to operate in every case and to follow, rather, the policy of selection. If it is said that such an unfortunate experience demands more strongly than ever that every case should be operated upon as soon as the diagnosis is made, it should be added: but only when the diagnosis is made early. He is compelled to admit that the high mortality in a certain number of severe cases has excited considerable doubt as to the wisdom of intervention in every case. This doubt is further increased by a large percentage of recoveries in severe cases in which for one reason or another no operation was performed. From his large experience he is convinced that in some cases at least the operation adds the last straw, and hence the impropriety of making operation an invariable rule of procedure. If all cases recovered after operation the question would be simple.

He believes there is a time for operation when practically all patients will recover, but he also believes that there is a time when many will die, when an unwise operation or an unwise palliation would be fatal. In other words, he believes that the greatest number of patients will be saved not by having a fixed rule, but by the exercise of good judgment added to a large experience. He makes a very good point, in that while the so-called radical surgeons may differ widely in theoretical discussion of this subject, when actually meeting at the bedside of a patient suffering from appendicitis they very seldom disagree.

He believes that when the infectious process has reached the peritoneum the prognosis, for various reasons, in many cases is better under palliative treatment than under operative, and, furthermore, the interval operation presents advantages which in a certain class of cases he believes offset the risk of waiting.

In discussing, in more detail, the question of operation as soon as the diagnosis is made, he says: "All depends upon when the diagnosis is made, whether the diagnosis is on the second or third day or later." If made very early, within the first twenty-four hours, he believes that the rule to operate is justifiable, although he calls attention to the great difficulty in differentiating at this early time appendicitis from various other lesions—for example, perforation of the stomach, acute cholecystitis, pancreatitis, extravasation of the intestines, and intestinal obstruction—and he adds that these as well as all acute abdominal lesions present symptoms that may strongly suggest appendicitis. This should be no argument against operation, inasmuch as any one of these conditions could only be relieved by operation, but there are other conditions, for example acute intestinal lesions depending upon errors in diet, gastric and intestinal catarrh, ptomaine-poisoning, cholera morbus, and even lead colic, that may very closely simulate appendicitis during its early period. He believes that it is a questionable practice to open the

abdomen at the onset of appendicitis of mild type, even when the diagnosis is reasonably clear. He adds that his reason for this position is, first, that the disease is so often mild and its manifestations so trifling that operation can be justified only on the ground that this slight attack may suddenly become severe—an event which, in his experience, he adds, is extremely improbable. In this class of mild attacks he would place those cases in which there is pain without nausea, vomiting, rigidity, or fever, which subside with great rapidity; he believes them appendicular colics rather than true infections, which justify intervention only when they occur so frequently as to produce disability; while the removal of the appendix in such cases may not be a serious matter, inasmuch as practically all the cases recover, the lesion itself is not sufficiently grave to justify opening the abdomen until repeated recurrences render the patient more or less of an invalid.

He believes that if any rule is to be laid down as to surgical intervention it should be that in the very beginning of the disease severe cases require operation, because there is always a perforation, gangrene, or extra-appendicular infection. Mild cases justify operation because there is little danger and because the wound can be closed. Mild cases will recover whether operated on or not, so the benefit of operation applies only to severe cases. After the first twenty-four hours of an attack he considers operation advisable if the symptoms are severe, and especially if they increase in severity.

With regard to the value of leucocytosis in appendicitis he states that one hundred cases were examined at the Massachusetts General Hospital by Dr. R. B. Greenough, and his conclusions are that leucocytosis may be considered a fairly constant symptom of appendicitis. The presence or absence of leucocytosis without other data is not sufficient to determine the condition of the appendix and its surroundings. In a series of cases the degree of leucocytosis corresponds roughly to the degree of temperature. The degree of leucocytosis when considered in connection with the duration of the attack is of considerable assistance in diagnosing the local condition. High leucocytosis—above 20,000—on the first or second day of the disease, suggests general peritonitis. A high leucocytosis after the first two days may be indicative of local abscess.

Discussing the relative value of the various symptoms of appendicitis—pain, rigidity, tumor—Richardson states that the value of tenderness is great. Few cases demand immediate operation when tenderness requires careful examination for its detection. In severe cases it is usually more acute and elicited without deep pressure.

In regard to the tumor of appendicitis he believes that this is a better guide to treatment than any other sign, for upon its situation and extent, more than any other one thing, depend the probable efficacy of opera-

tion. Tumor to the right or behind the cæcum may be easily walled off from the general peritoneal cavity, while those from the left or below only with much difficulty.

No combination of symptoms, he believes, is more urgent than occurrences of vomiting, indigestion and constipation in the early hours of suspected appendicitis. In these cases intervention should always be the rule.

In regard to cases seen for the first time on the third, fourth, or fifth days, Richardson asks, "Is it not fair to question at this time those rules of procedure which require in every case exactly the same line of treatment? May we not at least assume that some of these cases will recover without operation? Some will die with it, and admitting human fallibility, may we not, by applying a universal rule, turn the scale against the very patient who would have escaped by other methods of treatment?" It is at this critical period that he believes intelligent discrimination should be exercised. During these so-called fatal days of appendicitis—third, fourth, fifth, or even later—the results of operative treatment are still doubtful. Richardson believes it possible often to tide a patient over these critical days to a time when operation, consisting of a simple abscess drainage, is comparatively safe.

However grave the dangers pertaining to interference in the early days in severe cases, he says that these dangers must be encountered, (1) if the symptoms are becoming more severe, especially if there be any evidence that a sudden distention is taking place. (2) If the patient is dangerously septic, shown by pulse and temperature. (3) If there is increase in the symptoms.

Richardson believes that the dangers of contaminating the viscera from rupture of the abscess, by the breaking up of adhesions during the operation, a much less serious complication than is the opinion of Morris. In reply to the statement that the peritoneum may be relied upon to take care of a large quantity of fluid saturated with living micro-organisms, Richardson states that such an expectation is contrary to common-sense and general experience, and in this opinion I most thoroughly concur. The opinion of Morris, that we need give little attention to the remainder of the septic fluid distributed about in the peritoneal cavity, relying upon the hyperleucocytosis to render it innocuous, is not sufficiently supported by facts to warrant the surgeon in placing much reliance upon it.

Richardson would treat medically those cases in which there is reasonable hope that the slightest shock will turn the scale. He states that the principle is the same as that of operation in shock after severe injuries. As one would wait until shock had subsided before amputating a limb, so he believes operation should not be done during

the profound shock of peritoneal absorption. The analogy in these two classes of cases does not seem perfect, for the reason that the patient whose peritoneum has absorbed so much toxin as to produce profound shock seldom rallies.

Richardson states that the difficulties in the way of settling the question of intervention in these cases of great severity are extreme, and he offers his opinion with great diffidence. The question of early *versus* late operation in appendicitis is ably discussed by C. Mansell Moullin,¹ of the London Hospital. His views are much more radical than those of most English surgeons. As to the time of the operation he states that in America this is done early with laparotomy as soon as diagnosis of progressive appendicitis is certain. Any case, whether in first attack or not, which shows definite signs of increasing disease after thirty-six hours, should be operated upon without further delay. In England he states that neither early operation nor operation during or after the first attack is in favor. When the symptoms are so imperative that delay is out of the question, English surgeons believe it better to wait at least until the fifth day. Moullin strongly sides with the American view, quoting the statistics of the pathologists Hawkins and Kelynack. He says that if all the relapsing cases (59 out of 264) had been operated upon during or immediately after the first attack, seven lives would have been saved and fifty-two other individuals would have been spared a more or less severe illness, provided, of course, that these early laparotomies had terminated favorably. Kelynack advocates operation in rapidly progressing cases, which usually go on to catarrh or gangrene, or in order to forestall the perforation. Moullin believes that statistics, so far as the evidence they give is of value, are decidedly in favor of early operation.

In regard to the cases of slight severity which show signs of improvement before thirty-six hours, Moullin holds the same opinion as Richardson, but states that no one, so far as he is aware, proposes to operate upon these, at any rate during the first attack, if the inflammation is not progressive. (He was evidently not familiar with the writings of Morris and Murphy.) The general mortality of cases sufficiently severe to be admitted into hospitals, Moullin estimates to be 14 per cent.; Hawkins 20 per cent. If all the cases, excluding the mild ones showing improvement within thirty-six hours, were operated upon at the end of thirty-six hours, he believes that instead of a mortality of 14 per cent. or higher we should have a mortality of 5 or even of 2 per cent. It might be said that by this method of procedure a number of unjustifiable or unnecessary operations would have been performed.

¹ *Lancet*, December 16, 1899, p. 1657.

Moullin points out very clearly that we should not assume that any of these operations were unnecessary, and states that for some time past he has advocated operation at the earliest possible opportunity in all of those cases which have not shown definite signs of improvement within thirty-six hours, and thus far he has not met with a single case in which he has had cause for regret. In regard to the question of relapse he believes that 50 per cent. is a low estimate. Taking 100 cases admitted into the hospital, 28 will suffer from local suppuration or diffuse peritonitis and be operated upon. Of the remaining 72 cases, 36, or more than one-third of the whole, will suffer from one or more relapses in which they will incur the same risk again, and each case will then be kept in bed for an average of twenty-five days. It seems to require some hardihood to assure a patient at the beginning of an illness that an operation is unnecessary when, even if he gets off with his life, his chances of making a perfect recovery without operation are a little better than one in three.

In regard to the question of classifying appendicitis as suppurative and non-suppurative, Moullin states that suppuration occurs in a much larger proportion of cases than is usually believed.

Morris, unlike Richardson and Moullin, does not believe that it is possible to classify cases of appendicitis into mild and severe, and in a recent letter to the *Medical Record*, March 10, 1900, page 432, he discusses this question at some length. He states that he knows the pathology of appendicitis, and does not know a mild case from a dangerous one. This point forms an important feature in nearly all the arguments in favor of operation as soon as the diagnosis is made. Thorough study of the pathology as well as the clinical history of appendicitis I believe will show this position not well founded.

In a series of 200 cases of appendicitis recently published in the *Lancet* by H. A. Caley, of London, the question of the pathological basis of prognosis was discussed in a very able manner. Of the 200 consecutive cases treated in the wards of St. Mary's Hospital, 98 cases were treated in the medical wards, with 3 deaths; 102 were treated in the surgical wards, with 22 deaths, a certain proportion of the surgical cases having been transferred to the medical side. The low mortality of the medical series Caley attributes to the fact that in a large proportion they were cases of appendicitis with local non-suppurative peritonitis; while in 20 out of the 25 fatal cases general peritonitis was present. The mortality of the entire series of 200 cases was 12.5 per cent. Caley says that it is certain that hospital statistics give an exaggerated idea of the tendency to fatal termination, for the reason that many of the mild cases never reach the hospital, while the more severe forms of general peritonitis gravitate there.

Treves believes that in a large series of cases, including hospital and private, the mortality would be nearer 5 than 10 per cent. Hawkins, from a study of 264 cases observed at St. Thomas' Hospital, states that careful differentiation lies at the very root of correct diagnosis, and, therefore, prognosis.

Caley divides the 200 cases into five classes: Simple appendicitis; 99 cases recovered, none died. Appendicitis with localized suppuration; operation in 27 cases; 29 recoveries, 2 deaths. Appendicitis with diffuse peritonitis; operation in 17 cases; 3 recovered, 20 died. Chronic and relapsing appendicitis; operation in 37 cases; all recovered. Appendicitis with special complications; 2 recovered, 3 died.

In regard to the possibility of making a correct prognosis from single signs, Caley says: "Much stress has been laid upon the impossibility of ascertaining early in an attack whether resolution or suppuration will be the outcome, and upon pathological grounds this difficulty from a prognostic stand-point is not the most important point. The important questions in the first instance are, Will the peritoneal infiltration be localized or diffuse? Is it a mild attack, or is it one of the grave forms of appendicitis with which we have to do? There is no single indication which may not mislead, but the sum of the indications will not usually do so." Caley found that in the great majority of mild cases the pulse-rate was between 80 and 100, and he considers a low pulse-rate a very valuable guide as to the severity of an attack. In mild cases the symptoms will usually abate or become localized in from twenty-four to forty-eight hours, and if the infection be of a severe type the symptoms will persist and become intensified. In Richardson's table of 904 personal cases 259 acute cases were operated upon with recovery, and 72 with death. Richardson adds that the most significant cases in his table are 158 acute cases that recovered without operation; 31 acute cases died after operation had been performed. Richardson operated upon 238 cases in the interval without a single death.

As regards the mortality of operation for appendicitis, Richardson says that in a certain class of cases there is no practical difference between different operators. Those cases in which the patient is profoundly septic with general peritoneal infection dies, no matter who operates or how. It is idle to contend that such cases can be saved except by miracles. Those who have a small record of mortality have met a small number of such cases. Richardson's final conclusions are as follows:

The rule that needs to be constantly repeated is one that calls for the surgeon early in the disease. It cannot be repeated too often.

In the discussion of Richardson's paper, Deaver, of Philadelphia, stated his position as follows: He would operate upon every case as

soon as diagnosis has been made, with two exceptions: acute appendicitis in connection with general peritonitis, and, second, collapse. The reasons for this position, he states, are that the early hours are the time *par excellence* for operation; the majority of cases operated upon at this time get well or at least give the lowest mortality. Of 18 cases operated upon in the first twenty-four hours only 1 died, a mortality of 5.5 per cent.; of 30 acute cases operated on within forty-eight hours, 10 died, a mortality of $33\frac{1}{3}$ per cent. The second reason is, that the percentage of patients who have one attack and then remain perfectly well and free from other attacks is infinitesimal. Of 460 of his own cases 312 had more than one attack. Hence he argues that it is unjustifiable to offer a patient this faint hope of any attack being the last.

I do not believe this fairly states the position of the other side, especially of Richardson, since he would not advise against an operation with the hope that the attack would be the last, but that a mild attack would probably recover or perhaps subside, so that an absolutely safe operation may be performed during the interval. Deaver states that the physician who waits for the appearance of severe symptoms, or, worse yet, till the symptoms increase in severity, for an indication for operation, will have many unnecessary deaths to his credit. There is just as much reason to say that the surgeon who operates at once as soon as a diagnosis is made in a mild case, instead of waiting for thirty-six hours for the symptoms to abate, will have an equal number of unnecessary deaths to his credit.

Christian Fenger, of Chicago, stated that he indorsed Dr. Richardson in all that he said in reference to appendicitis, and in his opinion the position taken by Deaver was altogether too radical. In continuing the discussion, Senn, of Chicago, stated that uniformity of practice in the treatment of appendicitis will probably never prevail. He believes that any surgeon who follows such a stringent rule as that advocated by Dr. Deaver to-day may be a good practitioner, but he would certainly make a very dangerous teacher. He believes that the weak point in the surgical profession to-day in the treatment of appendicitis is the difficulty of making an early diagnosis in the first attack. He believes that while the rule to operate as soon as a diagnosis may be made may be comparatively safe in the hands of Dr. Deaver, to other men who lack the knowledge and skill, or in the hands of the majority who are called upon for appendicitis operations, it would be very unsafe. He states that through personal knowledge he knows of many men who have been guided by the rules of Deaver who have repeatedly removed healthy appendices.

B. F. Curtis, of New York, believed that a fairly large number of

actual cases occur which are most suitable for medical treatment, and these should be left alone.

Harrington, of Boston, while a little more radical than Richardson, would not operate in every case. He believes that there are cases of appendicitis in which improvement is more than probable, and in these cases he would not allow operation. If there is a reasonable doubt he would operate. In the severe types of the disease he thinks the dangers of waiting are greater than the dangers of operating. After the operation has been decided upon there is one less important point which has not yet been entirely settled, namely, should the appendix be removed in every case?

Richardson thought the removal of the appendix is contraindicated when an abscess is present which can be drained through a small incision in the abdominal wall. To this rule he makes the following exception: that when the abscess is on one side and the strength good, and the general peritoneum can be well isolated, the appendix may be sought for and removed.

Richardson's method has practically changed in the direction of more frequent search for and removal of the appendix, as shown by the fact that in 259 operations in acute cases the appendix was removed in 154 and the abscess drained in 105; while in 87 of his operations since January 8th, the appendix was removed in 82, and the abscess drained without removal of the appendix in only 5.

Richardson draws a very interesting analogy between certain forms of appendicitis with large abscesses and with deep-seated pelvic collections, and pelvic abscess from salpingitis. He says that operation through the abdomen in the acute stage of the disease, with large double abscess, causes excessive mortality; whereas a delay, with or without vaginal drainage, offers two advantages: one is the decreasing virulence of the micro-organisms, and the other decrease in the size of the tube. So that, as in pelvic abscess, he thinks that separation of the adhesions and drainage upward for the sake of removing the appendix causes an unjustifiable mortality, when by drainage through the vagina or rectum the patient, almost moribund, may be tided along to a time when through the abdomen an intelligent method may be employed by which the appendix may be safely removed and the abscess effectually drained.

A very important contribution to the pathology of appendicitis has been made during the past year by Dr. Aloysius O. J. Kelly,¹ pathologist to the German Hospital of Philadelphia. His conclusions are based upon a careful study of 460 cases of appendices removed during the

¹ Philadelphia Medical Journal, November 11, 1899.

fourteen months prior to January 1, 1899. Each appendix was weighed and photographed, and a record made of its length, the thickness of its wall, and the condition of its lumen throughout its extent. It was hardened and embedded, and sections were cut and stained from at least three regions of each appendix. In addition to all this, bacteriological investigations were made of the contents of the lumen and of the drainage fluid subsequent to operation. In addition to these 460 appendices, about 50 others, which had been removed at necropsy and were presumably normal, were examined from time to time for purposes of comparison. Kelly states that two forms of inflammation of the appendix may be justifiable—acute and chronic appendicitis. He also states that the acute manifestations may subside after a greater or less interval of time, and the pathological lesions may persist as a chronic inflammation. He further believes that if the acute inflammations be very mild they may possibly subside entirely and the appendix return to a condition indistinguishable upon histological examination from the normal; but this result, however, he believes to be rare. He goes into the etiology of appendicitis very carefully, and he believes the following to act as predisposing factors: (1) The shape of the mesoappendix; (2) excessive length as compared with width of the appendix; (3) Gerlach's valve; (4) histological structure of the organ; (5) blood-supply; (6) nerve-supply; (7) infection of the organ. While, as a rule, the appendix is completely involved by the fold of peritoneum, and hence is an intraperitoneal organ, exceptionally its posterior surface is without a peritoneal covering, and its relation may have an important influence in periappendicular suppuration. Excessive length of the appendix as compared with width is another important etiological factor, since this interferes with complete and thorough drainage.

He found the average length of the appendix 8 em., the average diameter of the lumen 3 to 5 mm., the relation of the lumen of the appendix to its length being in the proportion of 1 to 16 or 25. In regard to a histological consideration of the appendix, he believes that a large amount of lymphoid tissue in the appendix—a feature which has led writers to frequently compare it with the tonsil—has an important bearing upon the pathology of the inflammation. He states that the interesting cases of appendicitis do not differ from those cases which introduce inflammation in the other organs of the body, the most common causes being chemical irritation and bacteria. He states that the total number of appendices examined bacteriologically was 201, all removed during the year 1898. First, inoculation in each case was made from the lumen of the appendix after aseptic incision of its wall. At times the inoculations were made on the peritoneal surface of the appendix from the free pus in the peritoneal cavity. The results of

these later inoculations always corresponded to those of the primary inoculations in the lumen of the appendix.

Of these 201 appendices 94 were cases of acute appendicitis and 107 chronic. In the acute cases the *bacterium coli* commune alone was found in 69 cases, or 73.4 per cent. of the entire number. The *bacterium coli* commune with the *staphylococcus aureus* was found in 13 cases, or 13.85 per cent.; the *staphylococcus pyogenes aureus* alone was found in one case only. *Streptococcus* alone was found in no case, and in but one case in conjunction with the *bacterium coli* commune. Of the 107 cases of chronic appendicitis the *bacterium coli* commune was found in 96, or 89.7 per cent. *Bacterium coli* commune and *staphylococcus aureus* were found in 5 cases, or 4.7 per cent. In three cases no growth was found. As a result of these investigations Kelly is convinced that the *bacterium coli* commune plays by far the predominant rôle in the bacterial origin of appendicitis, having been found in 185, or 92 per cent., of all cases. As this organism outgrows other bacteria in artificial media, so in other conditions it remains and predominates in the appendix.

As to the importance of foreign bodies as an etiological factor in producing appendicitis, Kelly states: "While in the light of recent scientific and other research the views formerly maintained with regard to the rôle of various foreign bodies in the causation of appendicitis have largely been abandoned, the relation of what we know now to be fecal concretions to the development of appendicitis still demands careful consideration." While fecal concretions may remain for a long time, both in the intestinal tract and appendix, without causing inflammation, Kelly believes that they are found in the appendix more often when it is inflamed than when it is normal, more commonly in cases of acute appendicitis and in perforation and in gangrenous appendices than in any of the other acute varieties. They are also frequent in cases of chronic appendicitis. They were found in 74, or 16 per cent., of Kelly's cases. He states that there can be no question that they are more commonly associated with cases of acute appendicitis than these figures would indicate, since not infrequently in cases of appendicitis with perforation or any gangrenous appendicitis the fecal concretions have already escaped from the appendix before operation, and are either not detected or not observed. His conclusion is that in any ulcerative gangrenous appendicitis fecal concretions play an important rôle. In considering the relative importance of bacterial and fecal concretions in the causation of appendicitis, Kelly states that appendicitis has always, without exception, been an infectious process; that the inflammations of the appendix are the result of the activities of bacteria, and that the rôle played by fecal concretions is considered subsidiary to that of the bacteria.

In reply to the question as to why it is that the fecal concretions may be harmless in the intestinal tract and produce inflammation in the appendix, he says: "The reason for this is found in the anatomical and physiological peculiarities of the appendix, which, on the one hand, decrease the capability of the appendix to resist the influences of various morbid agencies, and, on the other hand, offer more opportunities for the rapid increase of virulence of the bacteria contained in the organ. The chief factor in producing this increase in virulence is the interference with thorough drainage of the organ. Defective drainage may be brought about by constriction from cicatricial connective tissue or by obstruction within the appendix by fecal concretions or foreign bodies."

The frequency with which actual foreign bodies are discovered in the appendix has been recently investigated by James F. Mitchell,¹ of the Johns Hopkins Hospital. Mitchell states that while ten years ago the presence of a foreign body was thought essential to an appendicitis, and the classical orange, grape, or cherry seeds were frequently described, at the present time we have gone to the other extreme, and to-day many writers go so far as to state that foreign bodies are never found as the cause of appendicitis.

He quotes the statistics of Fitz who in 152 cases of perforating appendicitis, found 12 per cent. of foreign bodies with 47 per cent. of fecal concretions. Hawkins, in 1895, at St. Thomas' Hospital, in 67 fatal cases did not find a single foreign body, and in 250 cases of appendicitis in the Johns Hopkins Hospital in the past ten years there was found only one foreign body—a segment of a tapeworm. Mitchell has made an extensive collection of cases from various sources in the last ten years—1400 in number—and finds that in about 7 per cent. true foreign bodies were found; in 700 of these cases in which a definite statement was made as to the nature of the foreign body there were 45 per cent. of fecal concretions. Among the interesting objects found in the appendix Mitchell mentions shoebUTTONS, worms, teeth, pieces of bone, as well as the old-time grape-seeds and cherry-stones. Osler, in ten years' experience in Montreal, found foreign bodies in only two instances; in one instance five apple pips, and in another eight snipe shot. Stone, of Omaha, and Ranshoff, of Cincinnati, each removed an appendix containing a bullet as the exciting cause. Dr. Carl Pfister, of New York, has recently removed an appendix containing three bird shot from a hernial sac.

In connection with this subject Mitchell calls attention to an observation found in the *Memoirs de la Academie Royale de Chirurgie*: "We notice, sometimes in opening the bodies of persons who during life have

¹ Johns Hopkins Hospital Bulletin, January, February, and March, 1899.

eaten a great deal of game, that there is collected in the intestines, and especially in the caecal appendix, a great quantity of shot, without these persons having had the least inconvenience."

Mitchell states that there is one class of foreign bodies far more common and important than any of these, viz., pointed bodies. Mitchell's papers contain several beautiful illustrations of appendices containing various forms of pointed foreign bodies. He has altogether collected twenty-eight cases in which a pin was found in the appendix at operation or at autopsy, together with two instances in which a pin had perforated the caecum. In no single case had there been any knowledge of swallowing a pin, and no intimation was had of its presence. Contrary to expectation, they occurred much more frequently in the male than in the female, being found in seventeen males and nine females.

Appendicitis caused by such a foreign body is by no means infrequent. While in the majority of cases rapid perforation occurred, some cases were associated with mild symptoms and recurrent attacks.

From his investigations Mitchell concludes that foreign bodies formerly thought essential in appendicitis are now known to play a much smaller rôle than that heretofore credited to them, and fecal concretions are much more apt to be present as the exciting cause.

An extended review of the earlier literature of appendicitis has been recently made by Edebohls.¹ He states that the magnitude of the labor is shown by the fact that the literature up to and including 1898 includes 2500 journal articles, dissertations, and books. As regards the relative frequency of appendicitis in the two sexes, Edebohls states that the most remarkable and apparently irreconcilable statements are made in this connection. While the theory is current that appendicitis attacks males in larger proportion than females, Einhorn, in 1800 cases, found primary appendicitis in 0.55 in males and 0.57 in females. Clinically, Edebohls states that he himself finds that 4 per cent. of all women have appendicitis. Edebohls does not state the data upon which his opinion is founded. Personally, I do not believe "that the positive determination of the health or otherwise of the appendix by direct examination and palpation of the organ in each and every case presenting is always possible."

In speaking of the treatment of the stump of the appendix after operation, Edebohls states that his method of the inversion of the entire appendix is the only procedure which does away with the necessity of opening the bowel, with the resultant risk of infection. He adds that his procedure, so far as he is aware, has found only one imitator, Dr. George R. Fowler, whose first and only case of inversion for

¹ *Medical Record*, November 25, 1899.

chronic appendicitis ended fatally. Edebohls says, however, that he has himself used the method in considerably more than 100 cases, inverting the entire appendix for chronic appendicitis, without a single death. Since the publication of Edebohls' article, Dr. J. F. Baldwin, of Columbus, Ohio, has reported (*Medical Record*, January 20, 1900) over one hundred cases of inversion of the appendix without mortality. In spite of these statistics, I do not believe this method the best mode of treating the appendix, and, except in very skilful hands, I do not believe it free from risk; moreover, quite as good results may be obtained by the ordinary methods of excision of the appendix in chronic appendicitis, as shown by Richardson, who has operated upon over three hundred cases of chronic appendicitis without a single death.

DRAINAGE IN APPENDICITIS. This question was discussed at much length in my article of last year. Nothing has been written since that time which has materially changed these conclusions. Edebohls states that gauze drainage is all but universally used in combination with rubber or glass drainage-tubes or alone. Morris states that the iodoform gauze drains, as usually employed, do far more harm than good and add to the mortality. He himself uses a slender piece of gauze surrounded by perforated rubber tissue, making a withdrawal of the gauze comparatively easy as well as improving the drainage. Morris goes so far as to say that iodoform gauze packing is very harmful, and that toxic effects are produced by a very small quantity of gauze. Murphy, on the other hand, who had given up iodoform gauze, afterward returned to it as the best method of drainage. Personally, I believe there is no risk attached to the use of iodoform gauze in reasonable amount, and that nothing else, unless it be nosophen gauze, quite fills its place.

Following the publication of Clark's paper there has been an increasing tendency to close the abdominal cavity in many cases in which pus is found, trusting to the power of the peritoneum to dispose of the septic matter remaining in the abdominal cavity. That the peritoneum under favorable conditions is not infrequently able to accomplish this successfully we cannot doubt, but that a larger number of septic cases will recover with the abdomen closed without drainage, than with, I believe is as yet far from proven. The weight of surgical opinion is at present strongly in favor of drainage in pus cases, although the large quantities of gauze left in the abdomen a few years ago are no longer used.

McBurney's most recently expressed opinion on the subject of appendicitis is found in his admirable article on the surgery of the vermiform appendix, just published in the *International Text-book of Surgery*.

In regard to appendicular colic he says: "Whether colic of the appendix may or may not occur without infection being present is still a mooted

question, but it is certain that in many operations which have been performed early in attacks of colicky pains in the appendix no inflammatory changes have been found, and in many others no evidence of recent inflammation has been found." He classifies appendicitis as catarrhal, suppurative, perforative, gangrenous, and chronic. In regard to catarrhal appendicitis, he says: "A large amount of lymphoid tissue contained in the mucosa of the appendix renders it prone to catarrhal inflammation." Such an attack, he states, will be accompanied by pain and vomiting, elevation of temperature, increase and rapidity of pulse. Pain is at first general, or may be localized in the epigastrium, and in a few hours it becomes well localized in the right fossa. Pressure at or near McBurney's point will show a marked degree of tenderness. There is usually present vomiting, the vomited matter being first composed of food, later mucus, and occasionally of blood. The temperature varies between the normal point and 103°, with a pulse of 90 to 120. There is always a certain amount of rigidity of the abdominal wall on the right side, but the abdomen is elsewhere soft. There may be a certain point of obstruction at the height of the attack, but this soon disappears. If the swelling in the mucosa subsides all the symptoms will abate, and in from one to three or four days the patient will appear to have recovered entirely from the disease.

Discussing the subject of chronic appendicitis, McBurney says an appendix which has been the seat of even so mild a disturbance as an attack of appendicular colic is in an abnormal condition, and is a menace to the health and even the life of its possessor. Such an appendix will be very liable to subsequent attacks of the disease. As to prognosis, McBurney says it depends largely upon the variety of the disease, and he believes that the severity of the lesions and the symptoms is in direct ratio to the virulence of the infection; that appendicitis frequently recurs which is recovered from sufficiently to permit the individual to die of other disease long afterward, has been amply proven. In 230 autopsies 70 per cent. showed evidence of chronic inflammation of the peritoneum about the appendix.

In regard to the treatment of appendicitis, McBurney is of the same opinion as Richardson—that this is entirely a surgical disease. He believes that every case of appendicitis is liable sooner or later to demand surgical interference. Nevertheless, he adds, the dictum that every case of appendicitis should be operated upon as soon as the diagnosis is made is not to be accepted. In many mild cases operation should be delayed until the acute attack has passed, in order that a much better and safer operation may be done in the quiescent period. In some cases the shock and general disturbance accompanying sudden perforation render it advisable to defer operation for at least a few hours. Excluding cases

of appendicitis which are characterized by such violent symptoms at the very outset that operation cannot be done too soon, palliative treatment is to be made use of on all occasions for a longer or a shorter time. Such measures are absolute rest, the recumbent position, cold applications such as the ice-pack or rubber coil, may be of great value in relieving pain, and are also of use in diminishing inflammatory action. As to the time of operation, McBurney says at the commencement of every case of appendicitis the question of operative interference should be carefully considered, that it is quite possible that a few hours may determine the absolute necessity for operation, and it is only by a careful study of the signs in the individual case during the first days and hours of its existence that a safe conclusion can be reached in regard to operative or non-operative treatment. In some cases in from one to two days it will become evident that the attack will soon subside, and a more favorable opportunity for operation may be selected than during the acute stage. In other cases study of the symptoms from the beginning may show that the disease is on the increase and that the safety of the patient demands an operation at a very early period. This is practically the same position as maintained by Richardson and Bull. In regard to the appropriate time to operate after recurring appendicitis various opinions have been expressed. McBurney states that in every case of recurring appendicitis surgical interference should be fairly considered during the quiescent period. He says that many surgeons and most physicians hesitate to urge operation upon a patient who has had only one mild attack, and advise waiting until other attacks have occurred. McBurney believes that, while the course of the disease in many instances will apparently justify this position, either no second attack occurring, or the second being no worse than the first, on the other hand, "of a given number of individuals in whom the disease has commenced with a single mild disturbance, a proportion large enough to be of grave importance will at the first recurrence develop a type of disease that is either very dangerous or even fatal." Hence the most frequent differences of opinion among professional advisers arise in the case of an individual who has had only one attack. McBurney's personal feeling in regard to these cases is that while recurrence is far from certain, it is extremely probable, and as the second attack may be severe and dangerous, he thinks it much easier to select the quiescent period, when all conditions are favorable to do the best and safest operations; he also feels justified in advising every patient who has had a single clearly defined attack of appendicitis to have his appendix removed in the quiescent period and before a second attack can occur, and he believes that many lives have been lost through delay under these circumstances. McBurney calls attention to the following method of

treating the stump. The peritoneal coat of the appendix is severed by circular incision at a point one-quarter of an inch distant from the cæcum ; this coat is peeled back for a short distance toward the intestine, and then complete section made at a point very close to the cæcum. The permeability of the stump is first to be determined by a probe, and then with the fine point of the Paquelin cautery the interior of the stump is to be thoroughly burned. With a pair of fine forceps the edges of the stump are brought together. The stump itself is slightly depressed, and a purse-string suture of catgut, previously placed one-eighth of an inch distant from the base of the appendix, is to be tightly tied.

McBurney does not think it wise in all cases to remove the appendix, believing it safer to leave the appendix than to insist upon the dangers of prolonged search. In regard to drainage, he believes that iodoform gauze furnishes the best form of drain. In acute cases he says that the iodoform gauze should be so introduced as to lie in contact with every portion of the tissue that has been involved. In cases where the general peritoneal cavity is more or less completely involved he recommends a systematic washing of every portion of the peritoneal cavity with hot saline solution of a strength of 0.6 per cent. and a temperature not lower than 115° nor higher than 120° . Complete removal of the septic material offers the only hope of success. In this case he advises the use of a glass tube, open at both ends with small lateral openings long enough to reach from the abdominal wound to the bottom of the pelvis. The rest of the wound should be extensively drained by means of iodoform gauze packings, strips of which in extensive lesions should be introduced in various directions among the folds of the intestine, while the whole region of the appendix, the wound being left open, should be well filled with gauze.

Notwithstanding the fact that we still hold that cases with septic material, either localized or free in the abdominal cavity, are best treated by means of drainage, it is but fair to call attention to some of the cases that have been successfully treated without drainage.

Maclarens¹ reports two very interesting cases. The first was that of a boy, aged sixteen years, who had previously had several attacks of appendicitis, and was finally operated upon on the second day of an acute attack. At the time of operation his pulse was 100 and his temperature 102° . On opening the abdomen and peritoneum it was stated that there was an immediate escape of foul-smelling pus and a quantity of gas. The appendix was found in a pocket opening freely into the general abdominal cavity ; it was gangrenous. In order to render irrigation easier a second opening, parallel and to the left of the median

¹ Medical Record, October 28, 1899, p. 617.

line, was made. Through this opening a second collection of pus, about one ounce in quantity, was found between the bladder and rectum and was removed. Eight ounces of peroxide of hydrogen, full strength, was poured into the abdominal cavity and allowed to remain for several minutes. The abdomen was then washed out with salt solution. The first incision was then closed, the abdomen was filled with saline solution, and the second incision was closed without leaving an opening for drainage. It is stated that the coils of intestine in the upper part of the abdomen were normal; those in the lower part were congested and covered with fine flakes of fibrin. At 7 A.M. next day the pulse was 104, temperature 101.2°. On the second day the pulse was 74, temperature 99.2°. The temperature never reached 100° after this. The bowels were moved with a Seidlitz powder on the fourth day.

The second case which Maclaren reports occurred in the practice of Dr. W. L. Platt, of Torrington, Conn. The operation was performed on the fourth day of the attack, and it is reported that the abdomen when opened showed a perforation, with an abundance of pus in the largest cavity. The intestines were inflamed and covered with exudate, which could only be washed off with difficulty. The same technique was used in this case as in the one already reported, namely, the abdominal cavity was thoroughly washed out with salt solution, hydrogen peroxide was then used, and the washing was repeated. The abdomen was then filled with saline solution, which was allowed to remain, and the wound was tightly closed. This patient also, with the exception of a small mural abscess, made an uninterrupted recovery. Both patients remained strong and well.

Reasoning from these cases, Maclaren states that he believes that drainage in such cases is irrational, because it does not drain and because any foreign body must add to the already existing irritation.

In cases of appendicitis with abscess formation not connected with the abdominal cavity he believes that drainage is perfectly proper. In the other cases, however, in which the septic material is free in the abdominal cavity, he believes that the conditions are totally different.

Woolsey,¹ in discussing the treatment of appendicitis when pus is present, says that the time since the onset of the attack is no absolute criterion as to the presence of pus. Pus or sero-pus may be formed in twenty-four hours or less; in other cases it may require several days. If after twenty-four, thirty-six, or forty-eight hours, depending upon the acuteness of the attack, the symptoms are not subsiding, but progressing, we may infer that pus has formed or is going to form. If pus has formed in an attack of appendicitis he believes that it should be removed

¹ Medical Record, April 1, 1899.

at the earliest possible moment. In those acute cases with the presence of pus he does not think the so-called one and one-half inch incision should be advocated, for the reason that, while obviating the danger of post-operative hernia, it produces a greater danger in the insufficient access it gives to the operative field.

In regard to the incisions of Jalaguier and Kammerer, though secure against hernia, he thinks they are objectionable, for the reason that one or more of the nerves supplying the lower part of the abdominal wall are divided by these incisions, thus weakening the abdominal muscles and predisposing to hernia. The oblique McBurney incision avoids this danger.

Discussing Clark's arguments against abdominal drainage,¹ Woolsey says, although the statistics of cases treated by Clark's method compare more than favorably with those in which drainage was employed in cases of pus tubes, we cannot adopt this ideal method in cases of appendicitis when pus is present, since the conditions are very different, because drainage in the region of the appendix is much more effective than in that of the pelvis. Woolsey mentions another and very important point. that pus in cases of appendicitis is not sterile, whereas in most of the cases of pus tubes it is. Woolsey takes the position, and I agree with him, that although a healthy peritoneum is capable of disposing of a large number of pathogenic bacteria, we are seldom if ever justified in putting the peritoneum to the test. The reactive inflammation about the drain is just what is needed to shut off the appendiceal area from the rest of the cavity.

In draining abscess cavities in appendicitis Woolsey advises thorough cleansing of the cavity without irrigation, and packing it lightly with gauze. The gauze drain, as it passes through the small opening left in the abdominal wound, is wrapped around with rubber tissue, which forms a collar and prevents the gauze from sticking to the edge of the wound and permits it to be easily removed on the second day. Early removal of the gauze he considers very important.

In regard to the propriety of always removing the appendix, Woolsey believes that it should be removed whenever possible and consistent with safety. He states that in his experience when pus is present the appendix lies upon the outside of the caecum in the larger proportion of cases. When in this position its removal, though technically difficult, is safe as far as making a secondary opening between the abscess and the peritoneal cavity. As the appendix is only removed after the abscess cavity has been thoroughly cleansed, Woolsey believes that the danger of rupturing the portion still between the abscess and the peritoneal cavity has been greatly exaggerated.

¹ Johns Hopkins Hospital Reports, vols. i., ii. and iii.

In conclusion the following facts may be emphasized :

1. In operations for appendicitis when pus is present the first consideration is the life of the patient, the second the avoidance of disagreeable sequelæ, of which ventral hernia is the most common, and hence the most serious.

2. Post-operative ventral hernia may be largely avoided, in spite of the necessary use of drainage, (1) by the use of the McBurney muscle-splitting incision ; (2) by suturing most of the wound, and (*a*) the use of provisional or secondary sutures in the part left open for drainage, or (*b*) the early removal of the gauze drain, facilitated by the use of a rubber-tissue collar where it passes through the wound, allowing the walls of the cavity and sinus to become approximated, thus avoiding the necessity of filling up by granulations.

3. By the latter method complete and firm wound union has been obtained in fifteen and a half days on the average, and in all ordinary cases inside of three weeks. To this end the appendix should be removed if possible.

4. The relative frequency of hernia following pus cases with drainage is another argument for early operation in appendicitis. It is also an answer to the charge that surgeons are too eager to operate for appendicitis, not infrequently expressed by physicians who would defer operation until the chance of success is diminished and the danger of post-operative hernia is increased.

THE WEIR-MCBURNEY INCISION. R. F. Weir¹ has used with great satisfaction the intermuscular method of opening the abdominal cavity for the removal of the appendix, as proposed by McBurney in 1894. At a second operation performed upon a patient nine months after the first laparotomy he found the abdominal wall so perfectly restored that traces of the division of fascial planes and of muscular separation were scarcely visible.

But in certain cases the muscular separation does not give the surgeon sufficient space to meet complications. Some surgeons have gained additional room by extending the median end of the incision upward along the edge of the rectus muscle. This weakens the abdominal wall. To avoid this Weir devised a plan of procedure which he has employed twelve times with complete satisfaction. It is as follows :

The oblique skin incision is made parallel to the fibres of the external oblique muscle, and the muscular fibres and aponeurosis of this muscle are separated parallel to the skin incision. With the fingers or the blunt ends of a scissors, the aponeurosis of the external oblique is stripped up from that of the internal oblique nearly or quite to the

¹ Medical News, 1900, vol. lxxvi., p. 243.

median line. The fibres of the internal oblique are next separated along a line from the iliac spine to the outer edge of the rectus muscle, and the aponeurosis is cut across the rectus muscle to the median line. The belly of the rectus being thus exposed, the muscle is lifted from its bed and drawn by a retractor to the median line, and the posterior sheath of the muscle and the peritoneum are divided transversely after the epigastric vessels have been caught and clamped. A superior view of the lower quadrant of the abdomen may thus be obtained. To quote the words of the author: "When blunt retractors are now passed into the peritoneal cavity and the abdominal wall put on the stretch there is a very superior exposure of the whole pelvis and of the right iliac fossa. Indeed, I have never before been able to command these parts so well until exposed by the incision, and particularly is it so if gravity action is induced by a sand-bag under the right hip or by a Trendelenburg position judiciously used after the removal of infecting inflammatory fluids."

The repair of this wound is performed as follows: The peritoneum and fascial planes are stitched with catgut, and a few catgut stitches are placed in the muscles to keep their fibres in apposition. The skin is stitched with fine black silk. If from the nature of the case drainage is required, it may be carried out at the point at which the lines of separation of the external and internal oblique muscles cross each other. A very firm primary union follows this method of opening the abdominal cavity, and as no nerve to the rectus muscle is divided, there is no bulging of any portion of this muscle.

WILLY MEYER'S HOCKEY-STICK INCISION. Willy Meyer regrets the indefiniteness that prevails in descriptions of the incisions used in operating upon the appendix. For an acute case he advocates an incision beginning half an inch above a point half-way between the anterior superior iliac spine and the outer border of the rectus muscle, on a line drawn from the iliac spine to the umbilicus. From this initial point the incision should be made directly toward the place where the femoral artery can be felt pulsating under Poupart's ligament. Its length can vary according to the necessities of the case.

An incision made in this way will be found exactly parallel to the fibres of the external oblique muscle, and it will cut through all of the abdominal muscles where they are thickest, and thus give very little risk of hernia.

In certain cases in which the appendix extends into the pelvis, or in which a pus tube or an ovarian abscess coexists with the appendicitis, more room is needed, and can readily be obtained by curving the lower end of the incision toward the median line until the outer border of the rectus muscle is reached. It is never necessary to cut this muscle, but

if a still wider view of the pelvis is desirable the rectus may be pulled aside. Sufficient space will then be obtained to enable the surgeon to operate upon the diseased organs of either the right or left side of the pelvis.

From the appearance of the wound Meyer has called the incision the "hockey-stick incision."

If no drainage is required, the whole wound may be sutured; if the case is a suppurative one, the upper part of the wound may be sutured and a drain left in the lower portion. If there is pelvic suppuration the drain is then in a particularly favorable situation, being directly over Douglas' pouch.

Meyer recommends his incision only for the special class of cases mentioned.

Cæcal and Paracæcal Lesions Simulating Appendicitis. The Society of Surgery of Paris, at the meetings held in January and February, 1900,¹ discussed the occurrence of lesions not appendiceal which still give appendiceal symptoms and demand essentially the same treatment. Numerous cases were reported to justify the theory which was brought forward by Bazy as long ago as 1895, that the cæcum may undergo inflammation independently of the appendix. In a girl of seventeen Bazy once found a mass of inflamed retrocolic glands, but no appendiceal trouble. Gerard-Marchant reported three similar cases. The glands were examined for tuberculosis, but no evidence of the presence of this disease was found. Quénau and Albaran mentioned cases in which there was found gangrene of the cæcum or ileum, either without the occurrence of appendiceal inflammation or distinct from the latter. Quénau also mentioned an instance in which the cæcum was covered by fibrinous exudate, which was shown by bacteriological examination to contain streptococci and *coli* bacilli, while the appendix was merely congested. Delbet operated upon a patient who had a perforation of the cæcum, giving rise to a rapidly spreading peritonitis, no involvement of the appendix being present. He objected to the term para-appendicitis, suggested by Quénau, on the ground that it is irrational to call lesions which have nothing to do with the appendix, para-appendiceal. Nimier said that he had twice made a diagnosis of appendicitis and operated, only to find an inflammation of the omentum. He believed, however, that the appendix was the starting-point of the inflammation, although it was not visibly inflamed at the time of the operation.

Routier disputed the accuracy of the inferences made in the cases cited. It was usually mentioned that the appendix was somewhat

¹ *La Semaine Méd.*, 1900, pp. 38, 60, 66.

inflamed, and in all probability it was the starting-point of the inflammation which in the caecum or paracaeal glands became more violent. Too much stress should not be laid on variation from the normal type. This question is quite distinct from the occurrence of secondary abscesses due to appendicitis at a point remote from it. There is no reason why such suppuration should not follow appendicitis as well as an infective process occurring elsewhere. He mentioned a case in point of an abscess of the spleen following appendicitis. Jalaguier took the same view, and explained in this the way the occurrence of paracaeal glandular infection, even though at the time of operation the appendix appears healthy.

HERNIA.

E. Willis Andrews,¹ of Chicago, gives a very interesting account of the major and minor technique of Bassini's operation as performed by himself.

Andrews visited Bassini during the summer of 1899, and had the opportunity of seeing a considerable number of his operations for hernia. Andrews makes an observation the truth of which I do not think is sufficiently appreciated. He states that the success in radical cure operations is the result of smooth, rapid work; so much seems to depend on getting the parts united with a minimum of lengthening and stretching. He states that the time required by Bassini for an inguinal hernia is from twenty to twenty-five minutes, while in the clinic of Gussenbauer and in other Vienna clinics it requires about double that time.

I believe, with Andrews, that rapidity of operation greatly increases the chances of prompt union, and, therefore, indirectly contributes to the final success of the operation.

Speaking of the details of Bassini's technique, Andrews states that the patient is shaved and cleansed on the previous day, but not dressed with sublimate gauze, or, indeed, any covering, the hands of the operator receiving an extensive and prolonged scrubbing for nearly thirty minutes before being placed in a 3:1000 sublimate solution. The patient is prepared before anaesthetization: first, a prolonged scrubbing with soap and water; second, copious washing with saline solution; third, sublimate solution copiously applied on compresses and poured over the parts. In addition to a rubber cloth protector over the body and legs, pieces of gauze three feet square are laid over the intervening parts in several layers, and sublimate, 3:1000, poured over this. A piece of gauze is tied over the penis. Sublimate solution is not used on the wound itself,

¹ Medical Record, October 28, 1899, p. 622.

although the hands and sponges are washed in bowls of it. Chloroform anaesthesia is used.

Andrews states that the incision through the skin is 12 to 18 cm. long, and is made 3 to 4 cm. above Poupart's ligament. If these measurements are stated correctly it would seem that the incision was unnecessarily long. I have always found an incision beginning on a level with the anterior superior spine, and slightly below and extending as far as the symphysis pubis, or about three and a half inches, sufficient for all requirements.

Bassini makes his incision by drawing the skin and fat into a fold transverse to Poupart's ligament, exposing the aponeurosis of the external oblique at a single stroke. The canal is laid open; not by dividing the ring and external oblique on a director, but merely with a stroke or two of the scalpel from above downward. While this may be easily done by an operator of large experience, I believe that opening the aponeurosis on a director is less likely to cause troublesome bleeding in the majority of hands. The external oblique aponeurosis is commonly dissected off by the handle of the scalpel, and sac and cord are next freed from the surrounding tissues. Andrews states that isolating the sac is usually begun at its neck. I presume he means just within the external ring, which renders the dissection much easier than if the attempt is made lower down. The neck of the sac is now detached from the internal ring by loosening the peritoneum for 2 cm. all around it. The deep epigastric vessels will always be seen if this has gone far enough. To facilitate the insertion of stitches the forceps is made to grasp the transversalis and internal oblique pointing from the internal ring inward, the blades grasping the whole of the posterior wall excepting the peritoneum. He states that this facilitates the placing of the deep stitches.

Personally I never use forceps of any kind in performing this step, the simple introduction of the index finger of the left hand being sufficient to push back the peritoneum and to furnish a ready guide and guard for the needle as it passes through the internal oblique and transversalis, thus avoiding the bruising of the muscles which would necessarily follow the use of a clamp.

Bassini uses a good-sized silk, previously sterilized by boiling in glycerin, threaded by the operator himself upon a semicircular self-threading needle. Bassini uses a needle holder for the two deep suture lines, but dispenses with it when suturing the skin. In places the deep stitches first begin close to the pubic bone; the first one or two may in some instances include part of the rectus muscle. The needle is always first introduced on the side of the internal oblique and transversalis, entering 1.5 cm. from the margin, coming out at the margin, and then passing

over so as to include the shelving edge of Poupart's ligament on the outer side. From four to six sutures are introduced, coming from below upward, the last one nearing the internal ring so that it fits tightly around the cord.

While Bassini introduces the stitches from below upward, he ties them in the reverse order, beginning with the one nearest the cord. Andrews states that the distance between these stitches is considerable—1.5 to 2 cm. This would seem to be altogether too much space to leave between the sutures. I cannot see how five or six of these sutures could be introduced in the canal 2 cm. apart. The cord is next replaced in the repaired canal and the edges of the external oblique aponeurosis are closed by running a continuous suture of silk. Bassini introduces one or two interrupted silk sutures at the upper and lower angle of the wound in addition to the continuous suture. He closes the skin by continuous silk suture. Drainage is seldom employed except in occasional cases where there is obstinate oozing, when rubber tubes are inserted at a point some distance from the suture line. Andrews states that the first and practically the only dressing is by means of sublimate

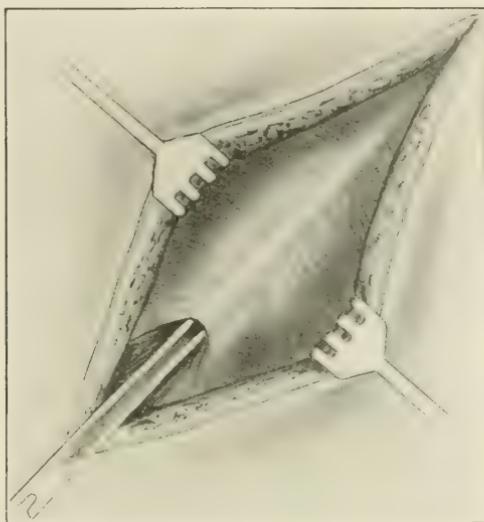
FIG. 5.



Incision.

gauze compresses. The accompanying illustrations show fairly well the principal steps of Bassini's operation as performed by Dr. Bull and myself during the past nine years. (See Figs. 5 to 11.)

FIG. 6.



Exposure of external oblique aponeurosis.

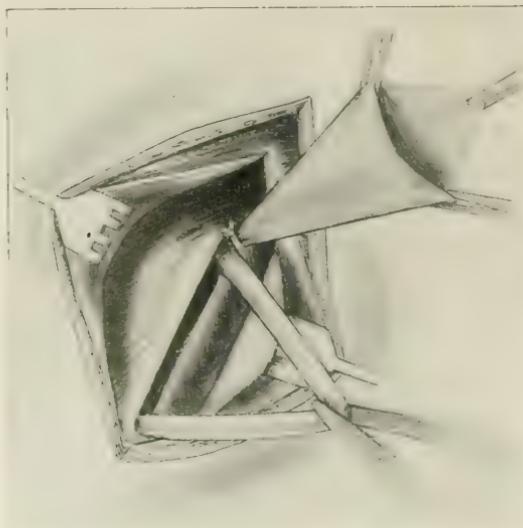
FIG. 7.



Aponeurosis divided, cord and sac freed.

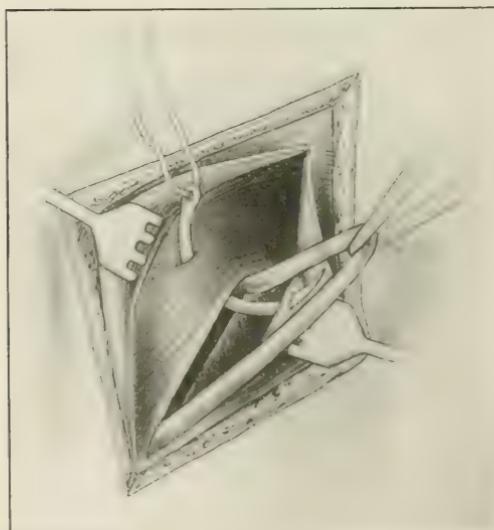
1. The external incision begins at a point nearly or quite at a level with the anterior superior spine, and continues obliquely downward parallel with and about half an inch internal to Poupart's ligament, ending at the centre of the external ring.

FIG. 8.



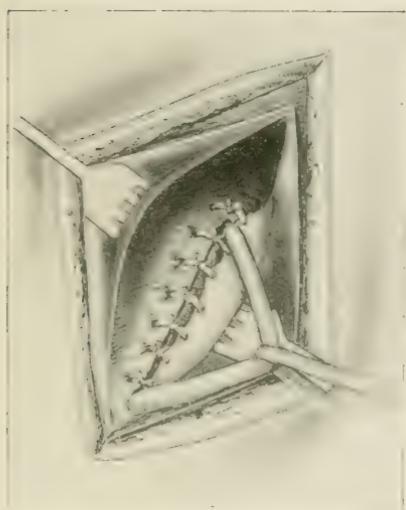
Sac separated from cord and tied off at internal ring.

FIG. 9.



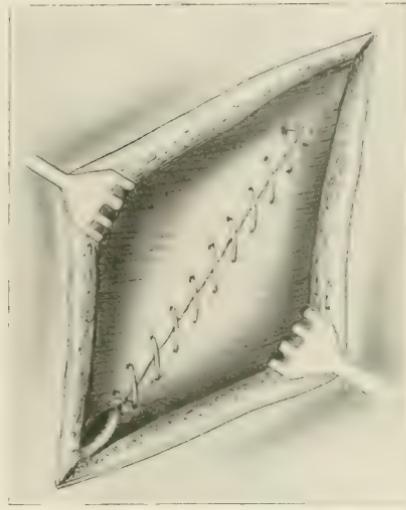
Introduction of first suture.

FIG. 10.



Section of deep layer completed.

FIG. 11.



Suture of aponeurosis.

2. The aponeurosis of the external oblique is freely exposed, and then, a director having been passed beneath it, it is slit up for a distance of two and a half to three inches.

3. The cut edges of the aponeurosis are then grasped with forceps, dissected free from the underlying muscles as far back as the edge of the rectus on the inner side, and on the outer until the shelving portion of Poupart's ligament has been clearly exposed.

4. The sac and the cord are then isolated *en masse* by means of the fingers and a blunt-pointed scissors. The sac should first be exposed on a level with or slightly above the external ring, and if the peritoneal layer of the sac is grasped with a pair of artery clamps the dissection will be easy, rapid, and bloodless.

5. The thin layer of infundibularform fascia, which in oblique inguinal hernia envelops the sac and cord in common, is now divided with the thumb and finger, thus permitting an easy separation of the sac from the cord. The sac is then grasped with two or three artery clamps and cut across transversely on a level with the external ring. The separation of the sac from the cord is then carried high up, well within the internal ring, until a point is reached where the sac widens out into the general peritoneum. The contents of the sac are then reduced. The sac is transfixed by a double catgut ligature well beyond the neck and securely tied. The redundant portion is then cut away about one-quarter of an inch below the point of ligature. The lower end of the sac, if the hernia be of the acquired variety, is then removed. If

congenital a sufficient portion is left behind to form a covering for the testicle. This is brought together by means of a purse-string catgut suture.

6. The cord is held up by means of the fingers or a bit of sterilized gauze or tape; the edges of the aponeurosis are held back by means of two retractors, while from three to five sutures of kangaroo tendon or chromicized catgut are introduced between that and the cord. These are best introduced from within outward, and should include the internal oblique and transversalis muscles, sometimes the edge of the rectus on the inner side, and the shelving portion of Poupart's ligament on the outer. The first suture should be so placed as to just touch the cord when held vertically to the plane of the abdomen. This is tied as soon as introduced, which, by bringing the parts to be united into clear outline, aids considerably in the introduction of the remaining sutures. An extra suture is now placed just above the cord through the same tissues as below to prevent any further separating by the stretching or widening of the new internal ring through which the cord emerges. This suture is not a part of Bassini's technique, but I have used it in nearly all of my cases.

7. The cord is now replaced, and the cut aponeurosis is closed over it by means of a continuous suture of chromicized tendon or catgut, beginning from above and extending as nearly as possible to the pubic bone without causing undue constriction of the cord.

8. The skin around is then closed with interrupted sutures without drainage.

The description of the operation has been given with considerable detail, and is further illustrated by a series of drawings made from life at the Hospital for Ruptured and Crippled, just published in the *International Text-book of Surgery*. I am greatly indebted to Mr. W. B. Saunders for permission to use these drawings.

By far the most lengthy and probably the most important contribution to the surgical literature of hernia made during the past year is that of Bloodgood.¹ This comprises a detailed report of 459 operations in the Johns Hopkins Hospital from June, 1889, to January, 1899. Special consideration is given to 268 cases operated upon by the Halsted method and also to the transplantation of the rectus muscle in certain cases of inguinal hernia in which the conjoined tendon is obliterated. In *PROGRESSIVE MEDICINE* for 1899, by the courtesy of Dr. Bloodgood, I was able to give some of the results in advance of his report. The complete report, filling 350 pages, is probably the most careful report on the radical cure of hernia that has ever been published, and is worthy

¹ Johns Hopkins Hospital Reports, vol. vii.

of most careful study. Great efforts were made to trace all cases to final results. Of the 394 patients operated upon for inguinal hernia 238 were examined by Bloodgood, 33 reported by physicians, and 36 were heard from by letter; only 4 were recent cases, and 44 patients only were lost sight of. Of 268 cases in which typical Halsted operations were performed 242 cases healed by primary union. The result was perfect in 208 cases. Slight weakness and scar in 4 cases; recurrence in 6 cases; cases not traced, 25; death after operation, 1. As to the duration of the cure, 1 case was well eight to nine years, 1 seven to eight years, 7 six to seven years, and 10 five to six years; 19 cases were observed longer than five years; 64 cases from two to five years, and 83 cases were free from recurrence upward of two years. Analyzing the cases of recurrence, Bloodgood says the recurrence occurred at the point where the cord emerged through the abdominal muscles, and was very small in one case; the recurrent hernia was situated in the lower angle of the wound and was associated with the obliteration of the conjoined tendon. This case, it was stated, was the only complete recurrence after Halsted's operation in which primary union occurred. Bloodgood concludes that a suppuration increases the probability, but does not influence the condition of the recurrence.

Bloodgood's conclusions as to operation in inguinal hernia were given somewhat in detail a year ago, and will not be here repeated. When during the dissection of the sac the cord is turned over, it is put in the canal and exposed to traumatism, and Bloodgood says the folds should not be excised, on account of the probability of epididymitis. In October, 1898, Bloodgood performed for the first time the splitting of the cord, transplanting the veins only. Since that time he has followed this method in twenty-six operations. In 19 cases there was no swelling of the testicle, and in 73 slight temporary swelling.

Bloodgood's report gives much valuable information concerning suture material. It is well known that Halsted has always advocated non-absorbable sutures, originally using silk, and later changing to silver wire. One need look no further than this report to find ample evidence that non-absorbable sutures should be discarded in operations for the radical cure of hernia. In 320 cases 87.44 per cent. had perfect wound healing, and in 46, or 12.56 per cent., some portion of the wound suppurred. Forty-six cases of suppuration Bloodgood classes as follows: Suppuration and skin infection, 12 cases—8 silk and 4 silver wire; 2 stitch abscesses, wound healing *per primam*. More extensive suppuration, 30 cases—22 silk, 8 silver wire. Acute early infection, 11 cases—silk 10, silver wire 1. Late infection, 19 cases, 5 per cent. Bloodgood states that two cases represent the only instances out of 252 cases closed with silver wire which had secondary abscesses. I pre-

sume he means sinus formation after leaving the hospital. He states that from within one week to four months there were discharged from the hospital four cases that returned with stitch abscesses. In one case there were three stitch abscesses and suppuration during the period of eight months after operation.

In studying the results of wound healing it is interesting to note the steady improvement during the past ten years. Of 11 cases operated upon in 1889-90, 36.36 per cent. suppurred; silk suture. During 1890-91, in 19 cases, silk suture, 26 per cent. suppurred; 1891-92, in 26 cases 34 per cent. suppurred. Curiously enough, in 1892-93 in 17 cases with silk suture there was no suppuration; while in 1894-95 in 9 cases with silk suture 5 suppurred, 55.5 per cent. In 1894-95 37 cases suppurred; with silver wire 4 suppurred, 10.8 per cent. In 1895-96, of 26 cases of silver wire 2 suppurred, 7.6 per cent. During 1896-97, in 63 cases with silver wire 4.7 per cent. suppurred. In 1897-98, in 102 cases only 1 suppurred. In 1898-99, of 87 cases, 4 with silver wire suppurred, 4.6 per cent.

Dr. Bloodgood calls attention to the relation between the difficulty of the operation, due to the adhesion inside and outside of the sac, and the healing of the wound. He states that in seven cases in which an adherent omentum was excised there were five suppurations, or 71 per cent. In these cases the sac was opened at once and the omentum dissected free, ligated, and excised, after which the sac was dissected free from below upward and excised. In another similar series of seven cases the peritoneum was opened above the neck of the sac, the omentum ligated through this opening, and then removed with the sac in one piece from above downward. All of these cases healed by primary union.

Bloodgood compares the wound healing in patients of different age and sex. Of adult males, 270 cases, there were 30 suppurations, or 11 per cent.; females, 34 cases, 3 suppurations, or 8.8 per cent.; children, one to fifteen years, 62 cases, 5 suppurations, or 8 per cent.

Comparing cases in which silk was used as a buried suture with those in which silver wire was used, Bloodgood says that, excluding six cases closed with silk and two closed with silver wire, in which there was only partial or superficial suppuration and in which only secondary stitch abscess followed, there remained 42 cases of more extensive suppuration, or 9.4 per cent.

One hundred and sixteen of these cases were closed with silk, with 28 suppurations, or 24.13 per cent.; 330 cases were closed with silver wire, with 14 suppurations, or 4.2 per cent. In 82 cases closed with silk, in which the wound healed by primary union, four cases returned with secondary stitch abscesses, while in 317 cases closed with silver

wire, in which the wound healed by primary union, Bloodgood states that only one case returned to the hospital with secondary stitch abscess. This should not be taken as absolute proof that these are the only cases in which late sinus formation occurred. Careful questioning of twenty-six patients observed at the Hospital for Ruptured and Crippled, who had sinus formation at longer or shorter intervals after operations in which non-absorbable sutures had been used, showed that in scarcely a single case had the patient reported his condition at the hospital where the operation had been performed. Bloodgood adds that of twenty-two cases of more extensive suppuration of the wounds closed with silk, in three cases only did the wounds heal without discharge of any of the deep sutures; while in thirteen cases of extensive suppuration closed with silver wire, in nine cases the wounds were completely healed in from two to five weeks without the discharge of a single silver wire suture. In four cases only were there stitch sinuses.

From these results Bloodgood concludes that silver wire has a distinct advantage over silk, since the larger number of cases have healed by primary union and the smaller number have been followed by stitch abscess or sinus formation. While not disputing in the main the conclusion of Bloodgood, it would seem, as I have already stated, that the superiority of the results after silver wire may be partly if not entirely explained by the improvement in the facility of technique of operation and to the introduction of rubber gloves, which occurred about the time that silk was given up.

Looking at the cases grouped in years, it will be seen that the percentage of suppurations—14.7 per cent. in 1893—compares very favorably with the 10.8 per cent. in which silver wire was used in the thirty-seven cases of 1894-95. Bloodgood himself calls attention to the great improvement that has been noted since the use of rubber gloves by the operator and assistants. He states that gloves have been worn by the operator, with very few exceptions, and by all assistants without exception, from February, 1897, to June, 1899. During this time there have been 226 operations for inguinal hernia, with but 4 suppurations. In 104 cases closed with silver wire, in which gloves were not used by the operator, there were 10 suppurations, or 9.6 per cent.; while in 226 cases closed with silver wire, in which gloves were used both by the operator as well as assistants, there were only 4 suppurations, or 1.7 per cent. Bloodgood states that personally since wearing gloves he has operated upon 100 cases of inguinal hernia, with only one suppuration.

Having apparently proven the superiority of silver wire over silk, Bloodgood makes no allusion to the possible advantages of absorbable sutures over silver wire. If we were able to show equally good results as regards primary wound healing by the use of the absorbable suture

it would do away with the possibilities of late sinus formation, which Bloodgood's statistics show is the real danger when silver wire is used, then we would be in a position to claim the superiority of the absorbable suture.

I have now personally operated upon 700 cases of hernia in which chromicized kangaroo tendon or catgut has been used for the buried sutures. The percentage of primary unions in the cases up to December, 1898, when I began to use gloves for assistants and rubber cots for myself, was 96 per cent. Of 150 cases operated upon since the use of rubber gloves I have had but one suppuration. Fortunately, in this case, a culture taken from the skin at the time of operation showed a pure culture of streptococcus. Very acute infection of the wound followed operation ; the cultures taken from the infected wound showed also the pure culture of streptococcus, thus demonstrating that the trouble was due to the imperfect cleansing of the skin rather than to any fault of the technique or suture material.

These statistics prove beyond question that kangaroo tendon can be perfectly sterilized, and that it may be used as a buried suture with quite as good, or better, results in primary wound healing as can be obtained with silver wire.

The more important question is, Will an absorbable suture, such as chromicized catgut or kangaroo tendon, give support to the parts approximated for sufficient length of time to effect a firm and lasting union? In other words, are the final results as good after the use of the absorbable suture as after the non-absorbable one? This question cannot be settled by simply comparing my own results with those of Bloodgood, inasmuch as the methods of operation were entirely different. The question of the efficiency of the absorbable suture in obtaining a permanent cure in Bassini's method, at least, is sufficiently proven by my results. Of 630 cases of inguinal hernia in which kangaroo tendon was used for buried sutures I have had but seven relapses, and the greatest effort has been made to trace these cases to their final results.

FINAL RESULTS IN 700 PERSONAL CASES. Great effort has been made to trace the cases after operation. Three cases were well eight to nine years after operation ; 3 were seven to eight years ; 16 were six to seven years ; 22 were five to six years ; 44 were four to five years ; 67 were three to four years ; 125 were two to three years ; 162 were one to two years ; 61 were six months to one year.

Seventy-six cases were not traced, and 96 were observed less than six months. Thus it will be seen that 279 cases were observed from periods of two to nine years after operation. Seven relapses have been seen following Bassini's method (in 630 cases), and of these four occurred in adults and three in children ; one relapse occurred one year

after operation in a stout man with a large irreducible omental hernia ; a second occurred in a young man six years after operation (during the last year he had been a cavalryman in the regular army, and remained sound until after a very severe attack of typhoid fever which reduced his weight from 140 to 90 pounds) ; on recovery a slight weakness was noted in the canal, but no protrusion. A third case occurred two years after operation and followed a kick in the groin. A fourth was of the very rare variety—inguino-perineal hernia—the testis being in the perineum and not in the scrotum. The testis in this case was not transplanted into the scrotum—a procedure which I have employed with perfect success in two cases. The wound was closed by Bassini's method, and a slight recurrence followed one year later.

But one relapse has been observed in upward of forty cases of femoral hernia, and this occurred in the only case in which there was suppuration.

Of the 700 cases two died as the result of the operation, Case No. 3 and Case No. 671.

Operation for Hernia Under Cocaine Anaesthesia. Bloodgood believes that from the observations at the Johns Hopkins Hospital the use of local anaesthesia is specially indicated in strangulated hernia. He states that in 18 per cent. of cases of strangulated inguinal hernia 28 per cent. of femoral and 33 per cent. of umbilical, the intestine has been gangrenous or a general peritonitis present ; and in 25 per cent. of these cases that bronchopneumonia was found at the autopsy. Ether was the anaesthetic used in every case. In such cases Bloodgood believes that the operation should be confined to a simple incision relieving the constriction and bringing the gangrenous gut out of the wound. Much of the separation could be easily done under cocaine.

In forty-two cases of strangulated hernia in which the condition of the bowel admitted of its reduction there were two deaths attributed to ether. He states that Cushing operated upon three cases of strangulated hernia with cocaine anaesthesia, with perfect success. Bloodgood himself has used it in two similar cases with much satisfaction. He reports three cases of non-strangulated hernia in the aged in which cocaine was used ; two of these cases were aged sixty-seven years and the third, eighty-three years. In two the cord was excised, and in the third the testicle was removed.

Bloodgood states that the operation was just as satisfactory as in the cases in which ether was used. The patients were allowed their breakfast. Just before the cocaine was injected one-sixth of a grain of morphine was given hypodermatically. The skin was injected with 2 drachms of a 1 per cent. solution of cocaine in 4 drachms of boiled water. No pain was felt during the skin incision or the division of the aponeurosis of the external oblique nor in the division of the sac. Some

pain and discomfort were noted during the ligation of the veins and the separation of the sac. The introduction of the deep sutures caused a little pain. It is stated that the patient aged eighty-three was a physician, and that during the entire time of the operation, which lasted one hour and twenty minutes, he carried on a conversation with the surgeon.

Bloodgood concludes that the experiences and results in these three cases have convinced him of the perfect feasibility of a very satisfactory radical operation, even in cases of very large herniae, with local anaesthesia. He furthermore believes that many cases of large hernia in old people in whom operation has been, up to the present time, contraindicated on account of the dangers attending general anaesthesia, will soon become suitable subjects for operative cure.

Cushing,¹ in a more recent paper, reports thirty cases of herniotomy performed under cocaine anaesthesia. He states that since the first cocaine operation (December 6, 1897) to December 9, 1899, 49 of 233 herniotomies were performed under regional anaesthesia at the Johns Hopkins Hospital by Drs. Halsted, Bloodgood, and Cushing. The reasons given for choosing local anaesthesia were that in a majority of the cases the administration of ether or chloroform seemed inadvisable or contraindicated; while in the remainder the local anaesthetic was employed at the patient's personal request.

Cushing states that almost all cases of hernia, with the possible exception of those in young children, could undoubtedly be subjected to radical operation under local anaesthesia, although a general anaesthetic is much preferred by patient and operator in cases where it can be safely given. Advanced age, chronic bronchitis, tuberculosis of larynx or lungs, cardiac disease, and chronic nephritis were the factors in the selection of Cushing's cases.

During the past eighteen months Cushing states that 200 cocaine operations have been performed at the Johns Hopkins Hospital, many of them major operations. Among them were 30 laparotomies, 2 gastrostomies, 3 cholecystotomies for empyema of the gall-bladder, 3 appendectomies, 1 closure of a traumatic rupture of the jejunum. In one case of hernia a mass of omentum the size of two fists was excised without pain. In operations upon the bowels, cocaineization of the gut has never been necessary. Cushing states that to insure success in any major operation under local anaesthesia an accurate knowledge of the course and situation of nerves likely to be encountered is most essential. All of Cushing's cases healed by primary union.

He states that the advantages of local anaesthesia greatly offset the disadvantages; the chief advantage being that we are now able to

¹ *Annals of Surgery*, January, 1900, p. 1.

operate with comparative safety on patients who would incur a risk under the use of general anaesthesia.

The Danger of Atrophy of the Testicle Following a Typical Halsted Operation. Bloodgood says distinct atrophy of the testicle has only taken place in those cases in which immediately after operation, there has been very rapid formation of a tumor in the serotum, with every evidence either of a haematoma or of extravasation of blood, and in four cases complicated with suppuration. In only one of these sixteen cases were the veins excised.

Bloodgood states that the cord was excised in twenty cases, and the reasons given for this procedure are that the cord was injured in three cases; in two more it was very adherent to the sac; in another it was accidentally cut; in two cases the testicle was atrophied, and in fifteen cases the cord was deliberately excised. Thirteen of these cases were old men between the ages of fifty-four and eighty-four years. In twenty-seven cases the testicle, together with the vas deferens and veins, was removed at the time of operation. In eight cases the testicle was excised, because undescended and associated with congenital hernia; in eight cases on account of very large irreducible hernia in old men, and in four on account of very large strangulated hernia in old men. In two cases double castration was performed for enlarged prostate, at the same time a large reducible hernia on the right side was operated upon.

The excision of the cord and the removal of the testes in such a large number of cases does seem justifiable. Personally, I have never removed the testicle except in a single case, which was an enormous inguino-perineal hernia with a very much atrophied testicle in the bottom of the sac. In dissecting the sac from the cord it should be always possible to avoid injuring the cord. Bloodgood believes that in some cases of undescended testicles excision of the testicle is justifiable, for the reason that it is difficult or impossible to transplant the testicle into the serotum, and, as a rule, the testicle is undeveloped and functionless. He states that in children both undescended testicles were never removed, though in one patient, a male, aged forty-three years, both testicles were removed during an operation for hernia. Bloodgood says that Dr. Halsted stated that undescended testicles causing hernia should be returned into the abdominal cavity or in some way preserved to the individual, believing that these undeveloped organs are important in the economy of the male.

Griffiths believes that the preservation of even an undeveloped testicle in a child is of very great value in processes of development. In discussing the question of injury to the cord Bloodgood states that in five cases of injury to the vas deferens all occurred during the first

fifty operations for hernia. In two of these castration was performed, in the third the cord was excised.

Inguinal Hernia in the Female. Thirty-nine cases of inguinal hernia in the female were operated upon in the Johns Hopkins Hospital. In twenty cases the round ligament was excised and the internal oblique muscle divided and transplanted (drawn down to line the wound). In six cases the ligament was excised, but the muscle was not divided. In three cases the round ligament was not disturbed, but the internal oblique was divided and transplanted. In five cases the round ligament was not disturbed and the internal oblique muscle was not divided. In two cases Bloodgood transplanted the round ligament and vessels up into the angle of the divided oblique muscle by the same procedure as employed in the male. Bloodgood concludes that although no observation is had showing that the excision of the round ligament is followed by a serious result, he believes that there are no good reasons why it should not be preserved and treated like the cord in the male. As to the results in these cases, 34 cases healed by primary union, 11 cases were lost sight of, 1 case died. There was recurrence in 1 case; perfect results in 21 cases. Three cases were well in three to eight years; 3 to two years; 9 to one year; 3 recent cases. Up to the present time very little has been written upon the treatment of inguinal hernia in the female. No single procedure has been accepted as the ideal operation, although Championnière, who has reported forty-eight cases, recommends the excision of the round ligament, and no serious results seem to have followed in his cases. While I believe, with Bloodgood, that the round ligament should be preserved, I differ, however, with him, and very strongly, as regards the advisability of transplanting the round ligament and treating it like the cord in the male. Furthermore, I believe that the serious objections to the division of the internal oblique muscle in the male obtain with even greater force in the female. In support of this theoretical contention, I would offer results of personal experience in the operative treatment of inguinal hernia in the female. In 119 cases operated upon between August, 1891, and April, 1900, the following method was used in every case:

The aponeurosis was split up well beyond the internal oblique as in the male, and dissected back on either side as far as the edge of the rectus muscle on the inner, and Poupart's ligament was exposed on the outer. The sac, which must always be sought just within the external ring, is first dissected from the round ligament and tied off by suture well beyond the neck. This can always be accomplished without dividing a single fibre of the internal oblique muscle. With the aponeurosis now held back with retractors on either side and the tip of the index finger passed beneath the internal oblique and transversalis muscles,

the peritoneum, the internal oblique, and transversalis are sutured to Poupart's ligament precisely as in the male, the round ligament being allowed to drop into the lower angle of the wound beneath the deep layer of sutures. The aponeurosis is then closed with a separate continuous suture of chromicized tendon. The skin is closed as usual in the male.

As regards primary and final results, with eight exceptions all of the wounds healed by primary union. All of the cases, with the exception of 13, have been traced to the final result; not a single relapse has been noted, and 46 are now well from two to seven years after operation.

This series of cases I believe sufficient to prove that the complicated technique associated with division of the internal oblique, transplanting the round ligament, and transplanting the rectus muscle are unnecessary in the treatment of inguinal hernia in the female. The simple operation which I have described, and which is practically Bassini's operation applied to the female, with the substitution of an absorbable suture, is simple in technique and can be easily performed by one familiar with it in from twelve to eighteen minutes, and gives absolutely perfect results.

PERSONAL RESULTS IN OPERATIONS FOR INGUINAL HERNIA IN THE FEMALE. Between 1891 and April 1, 1900, I have operated upon 119 cases of inguinal hernia in the female. Of these, 71 cases were in children under the age of fourteen years; the remainder, 48, were between the ages of fourteen and seventy years. Primary union was obtained in 111 cases, and slight suppuration occurred in 8. As to the final results, thus far not a single relapse has been observed. All except 13 cases have been traced. Of these, 1 is well between six and seven years; 2 between five and six years; 5 between four and five years; 14 three to six years; 24 two to three years; 25 one to two years; 16 six months to one year; the remainder are recent cases.

Surgical Anatomy of Hernia. An important addition to our knowledge of this subject has been made during the past year by Turek, of Chicago. He made careful dissections of inguinal hernia on 50 cadavers, of which 27 were males, 9 adult females, and the remainder children and fetuses.

Turek's results support the contention of Blake, that the internal ring derives its greatest protection from the internal oblique muscle. Turek says that it is well known that the lower and innermost fibres of the internal oblique muscle are the weaker, therefore the longer the ligamentous origin the weak fibres pass below and internal to the internal ring the greater is the protection afforded the ring by the strong outer muscular fibres which pass over it. The average length of the origin of the internal oblique in the female is 9.9 cm.—that is, the muscle arises on an average from the outer four-fifths of the ligament; whereas in the male it arises from the outer two-thirds.

This great length of the muscular origin would account in some measure for the relative infrequency of inguinal hernia in the female.

Summarizing his conclusions, Turck says: "The basis of the operation for the radical cure of oblique inguinal hernia should be first to restore the internal ring to its normal size and position; second, to so suture the internal oblique and transversalis muscles to Poupart's ligament as to render a firm protection to the lacerated ring. The spermatic cord should not be disturbed. Dragging it out of its bed and placing it in a new position by suturing the internal oblique beneath cause divergence in the internal oblique fibres immediately in front of the internal ring, and in reality serves to weaken the muscle where it should be strongest. Why this has been done and is being done every day is yet to be explained."

It will be seen from this that Turek believes one of the important features of Bassini's operation as well as Halsted's to be not only useless, but harmful. Dr. Bull and myself in several publications have stated that the transplanting of the cord might not be necessary, and we have published a series of cases in which the cord was not transplanted, the other steps being the same as in Bassini's operation.

The results in this series of cases, while excellent, were not quite equal to those in which the cord had been transplanted. The theoretical objections against transplanting the cord offered by Turek and others seem to be entirely answered by the almost perfect results that have been obtained by this method.

Dr. Joseph Blake, of New York, Assistant Demonstrator in Anatomy at the College of Physicians and Surgeons, has recently made careful dissections in twenty-five well-developed muscular subjects, with a view of making a careful and scientific study of the so-called conjoined tendon and the part that it plays in the radical cure of hernia. He found that in no case did the insertion of the lower fibres of the internal oblique and transversalis extend for more than five-eighths of an inch laterally to the insertion of the rectus; in the majority the extent was less than one-half an inch, and in some it was inappreciable, and this insertion was almost wholly formed from the internal oblique. There was uniformly, however, a distinct dorsal wall to the inguinal canal formed of the thickened transversalis fascia, and this is evidently what Bloodgood has referred to as the conjoined tendon. Blake states that our main reliance in the cure of inguinal hernia is the internal oblique muscle, and our effort should be to restore the normal parallelism of its fibres to Poupart's ligament. The phrase suturing the conjoined tendon to Poupart's ligament is inaccurate, since it is not done. Bloodgood says that in order to suture the rectus to Poupart's ligament it must be remembered that the incision of the lower part of the rectus sheath

supports the attachment of the more important parts of the internal oblique, the parts we depend upon for closure of the abdominal wall. Furthermore, the suture of the border of the rectus to Poupart's ligament changes the direction of the muscle fibres, and in contracting they will always tend to regain their original position.

In regard to Halsted's method of cutting the internal oblique, Blake says the greatest objection to this division is that the nerve-supply of these fibres is divided laterally, hence the mesial portion of many of the divided fibres are deprived of that supply, and must consequently suffer. Blake calls attention to a second objection which has been overlooked by most writers, that is, that the divided ends of the muscle of the internal oblique are not reunited in their normal relation, but the proximal ends of the distal fibres are slid downward and inward and sutured to Poupart's ligament. Blake says that it is the change of normal direction which prevents the muscle fibres from working as advantageously as if their parallelism with Poupart's ligament had been maintained. In brief, the conclusions of his series of observations are as follows :

“ 1. That what is generally understood to be conjoined tendon, namely, the insertion of the lower part of the combined aponeuroses of the internal oblique and transversalis muscles laterally to the insertion of the rectus abdominis, seldom exceeds a half-inch in width and is often inappreciable.

“ 2. That this insertion almost wholly consists of fibres of internal oblique muscle.

“ 3. That it affords generally little support to the inguinal canal.

“ 4. That, properly speaking, the conjoined tendon consists of the insertion of a few fibres of the internal oblique and transversalis with that part of the transversalis fascia known as the internal inguinal ligament, and which forms the main part of the dorsal wall of the inguinal canal.

“ 5. These fibres are apparently only occasionally developed and generally only found in muscular subjects.

“ 6. That the term obliteration of the conjoined tendon, used by Bloodgood, can only be applied to this structure.

“ 7. That the lower fibres of the internal oblique are normally parallel with Poupart's ligament, except just at their origin, where they pass over the cord.

“ 8. That the endeavor in radical cure should be to restore and maintain this parallelism, which, as shown by the results obtained, is best done by Coley's modification of the Bassini operation.

“ 9. The division of the internal oblique, either through its fibrous transplantation of the cord or as to its insertion by dividing the rectus sheath, is deprecated.

"10. That the insertion of the internal oblique laterally to the rectus is of less importance than that to the sheath, so that it may be divided if the sheath is, and by blunt separation of the muscle fibres the cord can be transplanted to an intramuscular position without injury to the fibres or their nerve-supply.

"11. That we must look to muscular and fascial dimples rather than peritoneal dimples as factors in the causation of hernia."

Blake's paper will soon be published in full.

Partial Enterocèle, or Richter's Hernia. Russel S. Fowler,¹ of New York, gives an interesting *résumé* of the literature of this variety of hernia. The first recorded case was that of Fabricius Hildanus, in the year 1598. The subject received practically no further attention until 1700, when Littré published his well-known article entitled *Observations sur une nouvelle espèce de Hernie*. Littré's paper was based upon three cases that had come under his own observation. The most important paper of recent times on this subject is that of Treves, 1887. Treves' special cases were four in number, of which three died and one recovered.

Richter's hernia may be defined as a partial enterocèle which has become strangulated throughout a portion of, but not the entire, circumference of the bowel, the portion varying from one-half to four-fifths. Fowler states that in the majority of cases the portion strangulated is less than one-half the circumference. This condition allows the passage of gas and fecal matter to a certain extent. In one-third of the cases, Fowler states, the symptoms vary in no way from the ordinary strangulated hernia; in the remaining two-thirds the symptoms are much less severe in character than those encountered in ordinary strangulated hernia. In one-tenth of these latter cases there were movements of the bowels on the first or second day of the strangulation. This form of hernia is more common in females than in males, and is apparently limited to adults. It is more frequently found in the femoral than in the inguinal region.

The condition that is most likely to simulate Richter's hernia is the small incarcerated omental hernia. The prognosis is bad; according to Fowler, in 50 per cent. of the reported cases the trouble was not diagnosed, and all of these died; according to Treves, the mortality of operation is 62.2 per cent. Fowler reports two personal cases, of which one died. The reason for this very high mortality is the difficulty of early diagnosis.

I have recently operated upon a case of Richter's hernia, occurring in a boy, fifteen years of age, at the Hospital for Ruptured and Crippled.

¹ *Annals of Surgery*, 1899.

There was a history of hernia since infancy in the left inguinal region, of the properitoneal or interstitial variety, always reducible up to thirty-six hours prior to admission. Prolonged taxis had been tried by the family physician, and, inasmuch as there had been a slight movement of the bowels and very little pain, the condition of strangulation was not recognized. The patient was advised to wear a truss. Vomiting occurred soon after the rupture became irreducible, and persisted whenever the patient took food. The tumor in the inguinal region was the size of a goose egg, and extended only down to the external ring. Immediate operation was performed; the sac was found between the internal and external oblique muscles, and contained about three ounces of serum, together with a knuckle of small intestine very tightly constricted by the thick fibrous neck of the sac. About four-fifths of the lumen of the bowel was occluded. On relieving the constriction the bowel regained its color and was returned; the thickened and oedematous sac was removed and the wound closed by Bassini's method. The patient made an uneventful recovery.

Strangulated Hernia. Hutchinson¹ says that primary resection of gangrenous, perforated, or irretrievably damaged intestine in a hernia must always be attended by a high mortality, but offers the best chance for recovery of any plan of treatment. He examined the hospital records in thirty-one cases of primary resection, in order to compare the mortality after suture with the mortality when Murphy's button is used. The button was used upon 15 patients, of whom only 1 recovered (7 per cent.), while suture was performed 16 times, with 6 recoveries (37 per cent.). Moreover, the patients who died after suture lived on an average twice as long after operation as those upon whom the button was employed; and the post-mortem appearances were in favor of suture. There was more attempt at repair and less congestion than when the button was employed. Artificial anus without resection was the treatment followed in eleven cases; all of these patients died.

Hutchinson thinks that the time required for suture has been exaggerated. A few minutes more or less are not of prime importance any way, as the after shock in these cases is not great. Special care should be taken with the mesenteric portion of the suture, and enough gut should be resected to bring the suture into healthy tissue. Maunsell's method is one of the best to follow.

LIMITS OF INTESTINAL RESECTION.

Kukula has found in German literature reports of forty extensive intestinal resections, including only those cases in which at least three

¹ *Lancet*, 1900, i.

feet of small intestine or two feet of large intestine were removed. Resection was performed in most cases for a non-cancerous affection. In thirty-one instances the portion of the intestine resected was chiefly or wholly small intestine. Nine of these patients died; not a high mortality (29 per cent.) when the fact is noted that resection was performed for gangrene in seventeen instances, and that three patients had peritonitis at the time of operation. That the deaths were not due to the removal of so large a piece of intestine is shown by the further fact that there were fourteen patients from whom more than five feet of small intestine were removed. Of these fourteen only two died, one in collapse and the other of inanition three weeks after operation.¹ This last patient was afflicted with carcinoma, and at the operation the ends of the gut were not sutured, but an artificial anus was established. No other patient seemed to suffer from the loss of a few feet of small intestine. The greatest amount removed, with recovery, was eleven feet. This patient was examined a year later, and various tests proved that his digestive powers were quite up to normal—a fact which his excellent physical appearance also indicated.

Removal of a considerable portion of large intestine was attended with a much higher mortality, six of the nine patients operated upon dying in less than a week (67 per cent.). Four of these patients suffered from peritonitis at the time of operation.

Kukula concludes that in favorable cases more than one-half of the small intestine may be resected without doing the individual permanent harm. It has been shown by experiments upon animals that more than three-fourths of the small intestine may be removed without serious disturbance of digestion. It would be interesting to know whether the removal of the ileum or jejunum is best borne, but evidence is wanting to settle this point. Most of the very extensive resections in man were chiefly of the ileum, but it does not follow that the upper part of the gut could not equally well be spared.

Unfortunately there is no accurate knowledge of the exact length of the small intestine. It certainly varies in different persons, and while numerous measurements have been made in the dissecting-room, they have no practical value for the surgeon, and the only safe rule, therefore, is to ascertain the length of the intestine which it is proposed to leave, as well as that which it is intended to take away.

It is absolutely essential if more than six feet of intestine are removed that the two ends shall be at once united by suture or button. If it is not possible to do this at the first operation it should be done as soon thereafter as the condition of the patient will permit.

¹ Arch. klinische Chirurgie, 1900, vol. ix., p. 887.

If the condition of the patient is favorable and there are no technical difficulties in the way, any amount of the large intestine may be removed with safety.

Experiments have shown that after resection of a considerable portion of the small intestine the part which remains may become more active in its power of absorption, that the large intestine may substitute for the small intestine which has been lost, and that nutrition of the patient may be further aided by the administration of suitable food at shorter intervals than is usually the custom with healthy persons.

PERITONEAL ADHESIONS AS A RESULT OF CONTUSIONS.

Noaek¹ has studied the development of peritoneal adhesions after abdominal contusions. Considering the important part the adhesions take in the production of ileus (30 per cent., according to most writers) it is rather remarkable that the relation of trauma to adhesions has been so little studied. Noaek was able to find only two reported cases in which operation had been performed on account of the colicky pains the adhesions cause. He adds four other cases. The history of each of these patients was very much alike. A severe blow in the abdomen was followed—when the acute symptoms had subsided—by colicky pains made worse by active motion, straining at stool, etc. Constipation was marked. In some instances the pains were so severe that the patient was kept in a state of hopeless invalidism. Medical measures, special diet, etc., only alleviated the symptoms temporarily. There was no question as to the diagnosis in these cases, for operation was performed in all. There was invariably a mass of adhesions between the anterior abdominal wall and the omentum, which involved also the colon, and usually one or two loops of small intestine. In every case the adhesions were successfully freed, and the symptoms disappeared and did not return.

PLASTIC OPERATIONS UPON THE COLON.

Colostomy. Much ingenuity has been spent in attempts to make a good artificial anus. Some men have too hastily heralded their own triumphs while reporting only one or two instances in which their method has been employed. Conclusions of this character are usually worthless, and especially so in connection with artificial anus, since a patient who has habitually hardened feces in his colon is not capable

¹ Mittheil. Grenzgeb. Med. und Chir., 1899, vol. v., p. 641.

of testing the merits of this or that procedure. The colostomy which is continent for soft or fluid feces is the only one which deserves to be called perfect.

The ease with which the colon may be brought to the surface and opened has perhaps led some operators to make too many fecal fistulae. At least the criticism has been made that surgeons are too ready to resort to this measure, when a more radical operation—an anastomosis—if successful, would save the patient from a life-long annoyance. Be this as it may, there will always remain a sufficient number of cases in which an artificial opening is the only possible relief to fully justify all the thought expended upon its technique. How, then, shall the constant soiling of the patient be prevented? This is the riddle to be solved. Some have so placed the bowel that the feces could be held back by pressure; others have twisted the gut; others have made a spout of the bowel, so that the feces could fall into a receptacle; while others still have tried to imitate as closely as possible the normal anus by utilizing muscular tissue to keep the intestinal opening tightly closed.

ANUS WITH MECHANICAL CONTROL OF FECES. Roux¹ has performed several times, with success, a suprapubic colostomy which he claims is a simple and certain method of avoiding incontinence. An incision is made in the median line, just above the symphysis, and a U-shaped piece is gouged from the bone, without disturbing the attachments of the recti muscles. The sigmoid flexure is then brought out of the wound, and at a point which allows four-fifths of its curve to go to the upper limb of the anus it is stitched into the wound, to the bone, to the muscles, and to the skin. If the operation is performed for cancer of the rectum the loop is not stitched above the symphysis, but is divided and its lower end closed and dropped back into the pelvis, while the upper portion of the loop is stitched in the wound in the manner described. After a few days, when it is evident that the anus is doing its work, the rectum can be resected through a sacral or perineal wound. Roux claims for this symphysic colostomy that the bandages do not slip from it as they do from a colostomy through the abdominal walls, and that it is more easily cared for and concealed by the patient. Defecation, especially if the patient leans well forward, is a simple procedure.

In a similar manner the crest of the ileum has been employed as a sharp edge against which pressure may be made to close the lumen of the bowel. Weir² has reported instances in which he carried out with success this method. One of his patients went about for months wearing only a pad of gauze held in place by a bandage. The opening dis-

¹ v. Mayer. *Revue médicale de la Suisse Rom.*, 1898, p 1.

² Medical Record, 1900, vol. vii.

charged solid fees every morning, and after that nothing came out of it until the following day.

It has been proposed to cut a hole through the ileum in order to bring the bowel out through it, but as the much simpler operation performed by Weir accomplishes all that could be hoped for by the more complicated one, there is no ground for its attempt.

Another plan is to flex the bowel sharply around the lower end or side of the sacrum. This procedure is, of course, useful in connection with a resection of the rectum, and has been carried out in various ways with more or less success since it was first suggested by Hochenegg¹ more than ten years ago.

Gersuny introduced a new principle, and tried to obtain the necessary obstruction to the passage of fees by twisting the bowel and so stitching it in place that it cannot untwist. A full description of this operation and the results of its application in the treatment of sixteen patients are given by Prutz.² With one exception all of the patients were operated upon for carcinoma, and death from recurrence of this disease often prevented a proper estimate of the functional power of the substitute sphincter ani. In several cases there was continence for solid fees, and one patient was able to retain perfectly even fluid fees. On the whole, the success of the operation may be said to have been proved in nine instances, and accordingly Prutz warmly recommends it as the simplest and best method for making good the loss of the sphincter ani. In all cases of amputation or resection of the rectum it should be performed primarily, while as a secondary operation it will be found useful in correcting the incontinence of fees which follows other unsuccessful attempts to make a satisfactory artificial anus.

Cordua³ succeeded in keeping a patient clean by making a spout of the bowel, so that fluid as well as solid fecal movements fell into a receptacle without soiling the skin. Resection of 20 cm. (8 inches) of the descending colon for carcinoma was to have been followed by anastomosis, but the ends would not come together. The lower one was closed and dropped into the abdomen and the upper one was brought out through the wound and stitched to the abdominal wall in such a manner that it projected two inches. When healing was complete this distance had slightly increased, and it was, therefore, very easy to fit a hard-rubber hood over it, to the lower portion of which a cup was attached by a screw. The whole apparatus was held in place by a steel truss-spring and straps. When fecal matter passed into the cup the

¹ Wiener klinische Wochenschrift, 1888, p. 324.

² Archiv f. klinische Chirurgie, 1897, vol. clv., p. 528.

³ Deutsche medicinische Wochenschrift, 1899, p. 26.

patient noticed its increased weight and went to the closet, unscrewed and emptied the cup, flushed it out with water, and screwed it again in position. There was no soiling of the skin, and the patient attended to his business as a restaurant keeper without embarrassment. This case is noteworthy because the fecal movements were always soft.

This same idea was carried out by Lauenstein¹ some years previous, but as his patient died in a few weeks of extension of the carcinoma, his device was not tested in an upright position. With the patient in bed it worked very well, the end of the intestine discharging its contents into an ordinary glass male urinal.

Von Hacker² reports a case in which the protuberant bowel was subsequently cut off at the patient's request.

ANUS WITH MUSCULAR CONTROL OF FECES. Greig Smith³ says that in the ideal colostomy there should be no leakage, no prolapse, no stenosis, and no gaping ; that the opening should remain of one size, neither dilating nor contracting, while the anus should rise above the surface so that ejected feces may be caught in a receptacle and not trickle over the skin. None of the feces should be allowed to pass on into the lower bowel. This perfect result, he claims, can always be obtained in the transverse colon, nearly always in the sigmoid and in a majority of cases in the ascending and descending colon. The first essential is that the whole tube shall be lined with mucous membrane. A fistula, however long, will always leak ; the second, that the mucous tube shall be surrounded by muscle, not connective tissue ; and the third, that the bowel shall be immovably fixed in the muscle by the strongest adhesions. He operates as follows :

A parietal incision, two or three inches in length, opens the abdominal cavity without the division of any muscular fibres—the fibres being separated by the fingers. For lumbar colostomy the skin incision is made parallel to the fibres of the external oblique. For an opening into the transverse colon a vertical incision is made over the rectus muscle. The loop of bowel is drawn out and fixed by a skewer passed under it, through its mesentery, and resting upon the skin. No stitches are needed. A graduated firm dressing prevents the extrusion of more bowel. The bowel may be opened immediately and a rubber tube inserted to permit escape of gas and fluid feces. At the end of a week the bowel is divided transversely down to the skewer, and in a fortnight it has retracted to the condition shown in Fig. 12.

The bowel projects enough to hold a rubber ring, to which is attached a rubber bag to catch the feces. Stenosis and dilatation are alike im-

¹ Centralblatt f. Chirurgie, 1894, p. 1086.

² Beiträge f. klinische Chirurgie, 1899, vol. xxiii., p. 628.

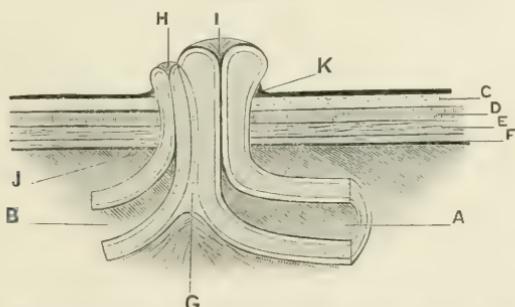
³ Lancet, 1898, vol. ii., p. 191.

possible, for mucous membrane never adheres, and active muscle does not waste.

Greig Smith has performed this operation twenty times. Twice an unusually thick abdominal wall, combined with a very short mesentery, prevented him from obtaining more than a fair measure of success. In the other instances the results were most satisfactory.

Von Haeker¹ has devised a method of colostomy by which the rectus muscle is utilized as a sphincter. If possible the operation should be performed in two steps. The sigmoid colon should be freed if not naturally long enough, so that the afferent and efferent portions of the loop may lie side by side, the most of the "slack" being given to the afferent intestine. By following von Haeker's directions the operator is able to determine the presence of metastasis and enlarged glands, as

FIG. 12.

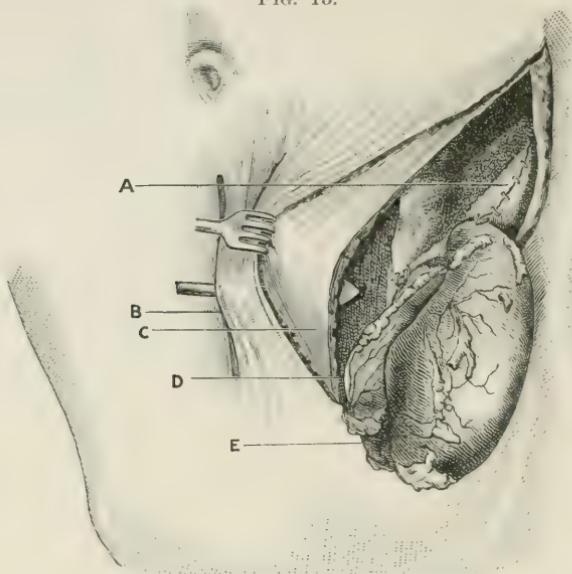


Cello-colostomy, bowel carried through separated fibres of parietal muscles. *A.* Entering bowel. *B.* Returning bowel, atrophied. *C.* Subcutaneous fatty layer. *D.* External oblique muscle. *E.* Internal oblique muscle. *F.* Transversalis muscle, fascia, fat, and peritoneum. *G.* Intestinal adhesions and mesentery. *H.* Opening into lower bowel. *I.* Artificial anus opening. *J.* Junction of parietal and intestinal peritoneum. *K.* Muco-cutaneous junction.

well as the motility of the sigmoid and the position of its upper and lower portions. The usual oblique incision is made above Poupart's ligament, the inner end of the cut reaching the outer border of the rectus muscle. The sigmoid is then drawn out, the afferent portion above, the efferent below. If it is too short its mesentery is freed on its outer side. The loop is then stitched in the peritoneal wound in such a manner that the efferent bowel will have plenty of room. (Fig. 13.) The finger strips up the overlying tissues from the transversalis fascia till the rectus muscle is reached. This is then divided into a posterior and anterior half, and a director passed from without inward to locate the cutaneous incision. The loop of bowel is then drawn through the rectal cleft and supported by a tube passed through its mesocolon. The

¹ Beiträge f. klinische Chirurgie, 1899, vol. xxiii., p. 628.

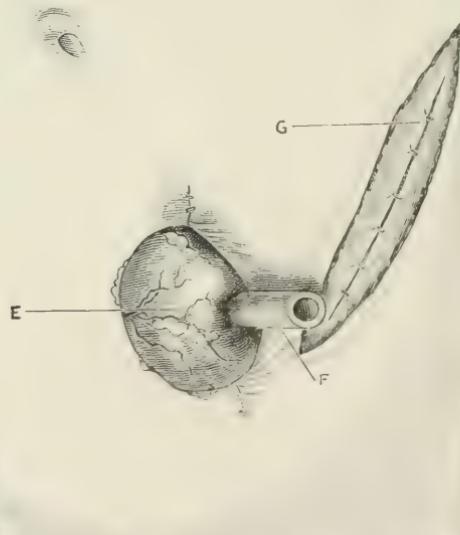
FIG. 13.



Intrarectal colostomy. (VON HACKER.)

a. Peritoneal fascial suture. *b.* Longitudinal incision through the skin to the inner side of the rectus muscle. *c.* Aponeurosis of the external oblique muscle. *d.* The anterior half of the rectus muscle. The muscle has been split and an elevator passed between the anterior and posterior halves of the muscle shows the passage-way through which the sigmoid is to be drawn. *e.* The sigmoid colon.

FIG. 14.



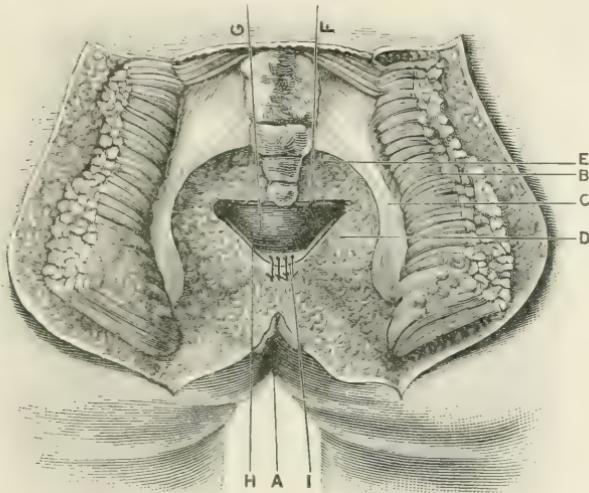
Intrarectal colostomy, the bowel in position. (VON HACKER.)

e. Sigmoid colon. *f.* Tube passed through the mesocolon. *g.* Sutured aponeurosis of external oblique.

first wound is completely sutured and the second one partially so. (Fig. 14.) The bowel is to be opened with a thermo-cautery in from two to eight days, according to circumstances.

Three cases are reported, and in all the wounds healed satisfactorily. One patient died of cancer without leaving his bed. The others went about for some months, wearing a light bandage and easily keeping themselves clean, *except when there was diarrhoea*. In one case the sigmoid colon was so long and free that von Hacker followed Lauenstein's

FIG. 15.



The glutei maximi dissected from the sacrum, coccyx, and from the great sciatic ligaments are reflected outward. The knife in this dissection followed the ligament closely to avoid injury to the nerves of the muscles. The levators have been dissected from the coccyx and from the coccygeal muscles and stitched to the rectum, leaving a defect in the diaphragm of the pelvis.

a. Anus. *b.* Right gluteus maximus. *c.* Right sacro-sciatic ligament. *d, d.* Fat in the recto-ischiatic fossa, covering the levator ani. *e.* The same layer of fat over the coccygeal muscle. *f.* The free edge of the coccygeus. *g.* Defect in the pelvic diaphragm caused by the suture below of the levators. *h.* Border of the left levator. *i.* Sutures. (LENNANDER.)

plan of making a spout of it 12 cm. (5 inches) long. By the request of the patient it was later amputated, as it was constantly exposed to injury.

Lennander¹ utilized the levator ani and the gluteal muscles to make a new sphincter to the rectum in a patient who had lost all control of his sphincters, together with a part of the posterior wall of the rectum, as a result of an acute suppurative inflammation. There was no contraction

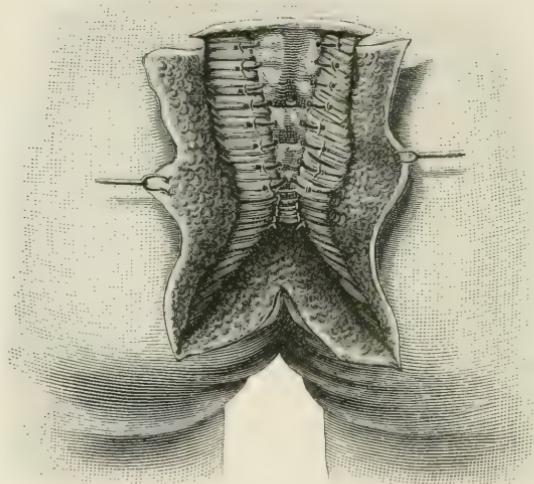
¹ Centralblatt f. Chirurgie, 1899, p. 722.

of the sphincter, either at will or under the action of electricity, while the levators acted both voluntarily and under electric stimulation. Under these circumstances Lennander felt justified in attempting to utilize the levator and gluteal muscles as sphincters, his dissections having shown that such a substitution is anatomically possible. Figs. 15 and 16 show the different steps of the operation.

The nearly completed operation is shown in Fig. 16.

The functional results in this case were excellent. For several weeks the patient's control over his new sphincter was educated by the injection into the rectum three times a day of 100 c.cm. of water. This was continued after he was up until he was able to retain it and discharge

FIG. 16.



The glutei maximi have been sutured to themselves and to the coccyx and sacrum.
(LENNANDER.)

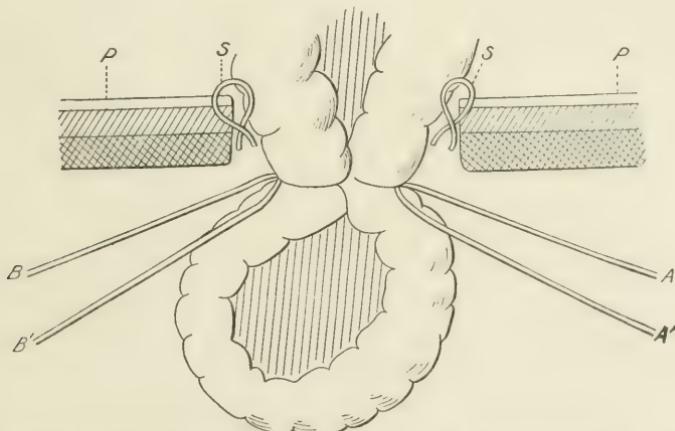
it at will. Indeed, the ultimate functional result was almost perfect. The operation seems to have a future in cases of non-malignant and perhaps even of malignant stricture of the rectum in which a resection has been performed but the levators have been left intact.

Gangolphe¹ has recently published a method of iliae colostomy which seems so at variance with recognized surgical principles that it is doubtful if many surgeons will care to try it. Still, he claims to have used it upon sixteen patients without a death and with most satisfactory results. The essential feature of the operation is the ligation of the bowel, which has been drawn outside of the abdomen. Ligatures are tightly applied

¹ Revue de Chirurgie, 1900, p. 179.

in two places (Fig. 17) and left for two days. By this time the 6 or 8 cm. (3 inches) of gut between them has become gangrenous. It is then opened with a thermo-cautery, the ligatures around the gut are cut and withdrawn, and the rest of the treatment is left to nature. In time the gangrenous tissue becomes separated and cast off and a double-barrelled anus is left, with one opening above and sharply distinct from the other, perhaps even separated from it by a firm cicatricial wall, so that the tendency of fecal matter to pass over from the upper into the lower gut does not exist. Most of the patients so operated upon had colicky pain for the two days before the bowel was opened, but there was no vomiting. There was usually some fever, but none of the grave symptoms of infection.

FIG. 17.



Artificial anus by strangulation. *P.* Peritoneum. *S.* Fixation-suture. *A, A', B, B'.* Interlocking ligatures, which are drawn as tight as possible. (GANGOLPHE.)

Colostomy as a Cure for Membranous Colitis. White and Golding-Bird¹ have four times made a fistula in the ascending colon in order to cure a patient of membranous or other chronic colitis, after many other methods of treatment had been employed without success. In every instance the patient was completely cured by the perfect rest of the colon and rectum thus obtained. They advise no other local treatment, especially no irrigation with strong solutions. Water or weak solutions of salt or boric acid are preferable if irrigation is used at all. They also speak of four similar cases treated with success by other surgeons of which reports have been published. In two of these cases the opening was made in the ascending colon, in the other two in the sigmoid colon. All of the patients were cured of long-standing trouble. Some of them

refused to allow the surgeon to close the colostomy for fear the disease would recur.

White and Golding-Bird consider colostomy indicated in (1) intractable membranous colitis; (2) chronic ulceration of the colon which medical treatment has failed to cure; (3) idiopathic dilatation of the colon. Few cases of chronic dysentery will require colostomy. Such an operation has been performed for dysentery, and was followed by death on the third day.¹

Some operators have made the opening in the sigmoid colon. This is irrational. It is surely better to place the whole colon at rest, and if medical irrigation is desired it can be much better carried out through an opening in the ascending colon. But care should be taken not to open the cæcum. This portion of the bowel cannot be pulled out sufficiently to admit a tube through its meson if it has one, and in consequence fecal matter will pass the opening and go on into the colon. Moreover, the fees at this point are still very fluid and are irritating to the skin.

Just how long the colostomy should continue after cure has been effected must be determined for each case. In one of White and Golding-Bird's cases the opening was closed in five weeks; in another it was left open a year. They think six months is not too long for colonic rest in these intractable cases.

Colostomy for Imperforate Anus. Colostomy has been performed in a condition which demands immediate relief, namely, in imperforate rectum. Montgomery² reports nine cases of this character. Operations upon a new-born infant are peculiarly difficult, and it is not surprising that only two of the children lived. The meson of the sigmoid is so short that great difficulty was experienced in bringing the gut to the surface. The formation of peritoneal adhesions in such young babies is very slight, and at the autopsies, made from three to seventeen days after operation, scarcely any adhesions were found. Hence the importance of suturing the gut securely to the abdominal wall.

In the fatal cases post-mortem examination was made to determine the feasibility of a perineal operation. In one case the rectum was entirely wanting. A fibrous cord, four inches long, extended from its termination in the iliac fossa to the bladder. In three cases the pouch extended to within an inch of the skin and ended in a thick mass of fibrous tissue connected with the base of the bladder. In two cases there was an anal cul-de-sac half an inch in depth and distant less than an inch from the lower end of the bowel. In one of these cases the per-

¹ Powell. Indian Medical Gazette, 1899, vol. xxxiv., p. 82.

² Lancet, 1900, vol. i., p. 304.

ineal method was first tried without success. In both of them the blind end of the gut was fixed well forward to the upper end of the vagina or the base of the bladder.

The writers conclude that colostomy is the best routine procedure in such cases. Some years ago Curling made up a table of fifty-seven cases, and in twenty-three of them the gut was not found by a perineal operation. Only five of the total number of patients lived long enough to be spoken of as cured, and four of them suffered from more or less stricture incontinence. It is safe to say that if the lower end of the bowel is more than half an inch from the surface colostomy should be performed.

Closure of an Artificial Anus. When it is desired to close an artificial anus the conditions are somewhat different from those which have to be considered in the closure of an ordinary fecal fistula. Usually the colostomy has been performed in such a manner as to prevent fecal matter from passing by the intestinal opening into the bowel below. In other words, the formation of a spur between the afferent and efferent portion of the loop has been exaggerated over what takes place spontaneously. According to Fenger,¹ this spur formation may seriously interfere with the passage of fecal matter by this point, unless in the closure of the intestinal wound the principle of longitudinal incision and transverse suture is carried out, as is done in the Heinecke-Mikulicz operation for stricture of the pylorus.

The longitudinal incision should be in the middle of the convex surface of the intestine, equidistant from the mesenteric attachments in order to avoid division of important vessels. Free mobility of the intestine and intact peritoneal covering are desirable conditions, but the latter is not absolutely necessary. In places where the bowel has no mesentery and where there is a limit to the infolding or bringing into apposition of the convex surface of the intestine there is a limit to the length of the longitudinal incision which is practicable. This remark applies to the cæcum, flexures of the colon, and the extraperitoneal border of the rectum. It is evident that the length of the longitudinal incision should not be unnecessarily great. Tension in the united wound and lack of free passage of fecal matter are the chief causes of failure if the sutures are applied correctly.

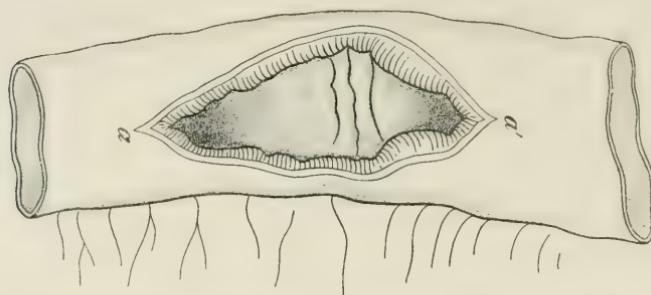
If the loop of bowel containing the artificial anus has been cut quite in two the upper end will probably be considerably larger than the lower. In that case the circumference of the two can be made equal by making a longer longitudinal incision in the smaller gut.

Fenger asserts that these principles can be successfully carried out in

¹ American Journal of the Medical Sciences, 1899, vol. cxvii., p. 431.

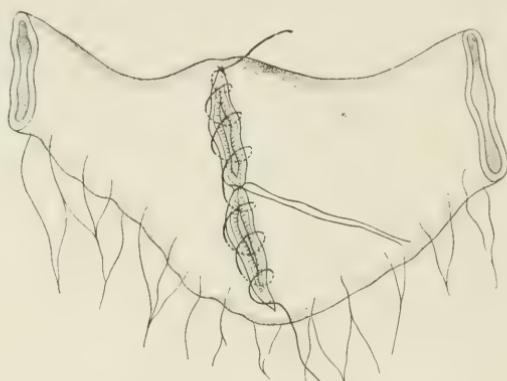
the closure of a colostomy opening, and thereby the more dangerous resection of the gut be avoided. He has performed this operation success-

FIG. 18.



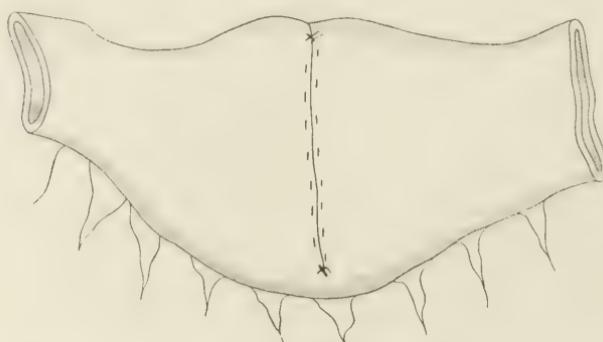
a, a'. The lower and upper corners of the wound in the ileum made to extend an inch above and below the fistula. Through these two points a guide suture is passed and tied. (FENGER.)

FIG. 19.



Continuous suture through the whole thickness of the intestinal wall. (FENGER.)

FIG. 20.

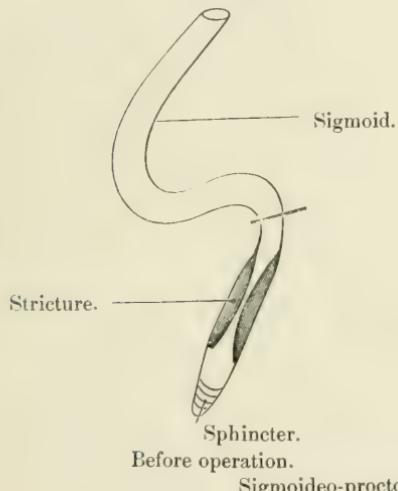


Continuous suture in the sero-muscular coats to bury the preceding suture. (FENGER.)

fully upon the lower part of the ileum. From a report of this case the accompanying illustrations are taken. (Figs. 18, 19, and 20.)

Sigmoideo-proctostomy. An interesting plastic operation upon the rectum, a description of which has been recently published, is called sigmoideo-proctostomy. Rotter¹ has performed it three times for non-malignant stricture of the rectum. Two of the patients recovered, but a third one died of septic peritonitis, caused, in the opinion of the operator, by his failure to surround the bowel with iodoform gauze before cutting into it. The illustrations (Figs. 21 and 22) need no detailed description.

FIG. 21.



Before operation.

Sigmoideo-proctostomy. (ROTTER.)

FIG. 22.



After operation.

A laparotomy was performed, and the bowel was cut across above the stricture and implanted into the rectum below the stricture, but above the sphincter ani. The useless free end of the bowel above the stricture was closed. The result was perfect in both cases. Intestinal and rectal functions were fully restored, the ulcers soon healed, and the induration about the stricture almost entirely disappeared.

Rotter's plan of treatment is a modification of that proposed by Bacon,² of Chicago, who in 1896 reported that he had operated successfully upon twelve patients, establishing an anastomosis between the bowel above and below the stricture by means of the smallest Murphy button. The opening thus made was enlarged upward by means of pressure by a clamp inserted through the anus, the blades of which were gradually pressed tighter and tighter together until necrosis of the septum resulted.

¹ Rotter. *Archiv f. klinische Chirurgie*, 1899, vol. lviii., p. 324.

² Medical and Surgical Rep., vol. lxxiv., p. 303.

Rotter proposed his modification on account of the difficulty in some cases of bringing the sigmoid down to the level of the rectum. His fatal case shows that such an operation is not without considerable risk.

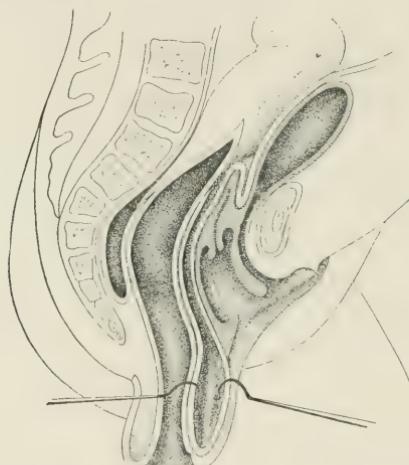
Rectal Prolapse. Ludloff¹ divides the various lesions which commonly pass under the name of prolapse of the rectum into three distinct classes :

1. Prolapsus ani.
2. Prolapsus recti, prolapsus ani et recti.
3. Prolapsus coli invaginati.

These three classes of prolapse differ in their origin and require different treatment.

Prolapsus ani is a bulging outward of the mucous membrane of the anus, to a limited degree, as a result chiefly of congestion of the lower

FIG. 23.



Prolapsus ani et recti. (VON ESMARCH.)

part of the rectum. It is associated especially with hemorrhoids. It must not be considered as a forerunner of prolapsus recti.

Prolapsus recti and prolapsus ani et recti are different degrees of the same trouble. In both there is an inversion of all the coats of the rectum. They are really forms of perineal hernia (see Fig. 23), whose sac is the anterior wall of the rectum, which draws after it, to a greater or less degree, the whole of the rectum. Etiologically, prolapses of this class are connected with all the causes which increase the abdominal pressure.

Prolapsus coli invaginati is an invagination in the narrower sense.

Each of these three forms of rectal prolapse has its own appropriate treatment. By far the most satisfactory method, as far as immediate

¹ Archiv f. klinische Chirurgie, 1900, vol. ix., p. 717.

appearances go, is resection of the rectum according to the principles of Mikuliez and Nicoladoni. It is contraindicated only in case of long-standing invagination of the colon. It is absolutely demanded in case of incarcerated and irreducible prolapse. On account of its risk and difficulty in performance, simpler methods of treatment, such as massage and colopexy, should be tried before resection is resorted to. Massage and colopexy should not be attempted if the prolapse is incarcerated, irreducible, or badly ulcerated. In all other conditions they may be tried, and they are especially indicated in prolapse which follows extirpation of rectal tumors.

Treatment by ligature may be tried if the patient is too weak for narcosis or to withstand the loss of blood.

Excision of the mucous membrane is indicated if there is present a very large prolapse of the anus.

Colopexy, with the formation of an artificial anus—colopexotomy, as it has been called—ought never to be performed.

Cauterization is a satisfactory treatment in cases of prolapsus ani, and in children in cases of prolapsus ani et recti. It is also of service as a secondary measure after other operations which have only partially succeeded.

Treatment by galvanism may be of use with insane patients or those whose nervous make-up leads them to prefer a long course of treatment to an operation.

Rectopexy, Gersuny's twist, and the application of a ring of silver wire, are not suitable methods of treatment for any patients.

The advantages of a saeral anus should always be considered in case of prolapse following a major operation upon the rectum.

If there is the slightest suspicion that the prolapse is due to syphilis, antisyphilitic treatment should be thoroughly carried out before an operation of any kind is performed.

Ludloff's general plan of treatment is as follows :

For prolapse of the anus : cauterization, either superficially or in radiating stripes. If the prolapse is very large : excision.

For prolapse of the invaginated colon : circular resection; or if it is situated very high up : laparotomy, longitudinal incision of the colon, withdrawal, amputation, and suture of the invaginated portion, and suture of the incision (Barker-Rydgyier operation).

For incarcerated, irreducible, or ulcerated prolapse of the rectum : circular resection.

For chronic non-ulcerated prolapse of the rectum or rectum and anus : massage for two weeks, according to the directions of Thure Brandt. If improvement is manifest the treatment should be continued until a cure is effected. If no improvement is noticeable in two weeks, then

colopexy should be performed; and if this fails and massage is again unavailing, resection is indicated.

Antisyphilitic treatment if there is any suspicion of syphilis.

Several days of active purgation should precede any operative effort, unless the condition of the patient contraindicates. For some weeks after operation defecation should be performed in a horizontal position.

SURGERY OF THE LIVER.

Cholelithiasis. Probably no other surgeon has had such an extended experience in the surgical treatment of gallstones as Hans Kehr, of Halberstadt. At the time of his last published report¹ he had operated upon no less than 406 patients. The article referred to deals especially with 202 laparotomies performed for this trouble in the previous two and two-third years. The records of 200 cases comprised in so short a time, and in the practice of a single surgeon, afford a unique opportunity for the study of this subject. Kehr's article of 247 pages is a supplement to his monograph² upon the same subject, published in 1896, and anyone who wishes to acquaint himself with the modern treatment of cholelithiasis should not fail to obtain both articles. In these pages it is only possible to give the conclusions which the author has drawn from the total of his personal experience and that of his colleagues.

The first step toward a correct understanding of the different forms of cholelithiasis is a classification based on pathological conditions. This is thus given :

1. Stones in the gall-bladder, with open cystic duct and no adhesions.
2. Stones in the gall-bladder, with open cystic duct and adhesions.
3. Stones in the gall-bladder, the cystic duct being closed by :
 - a. Inflammation.
 - b. Stones.

The inflammation, according to the grade of the infection, may be :

- a. Serous.
- b. Purulent.
- c. Gangrenous.

The accompanying peritonitis may be circumscribed or diffuse.

An acute and chronic stage is to be recognized (recurrent cholelithiasis).

If the inflammation extends to the neighborhood it results in a pericholecystitis, with or without exudate. From this follow adhesions between the gall-bladder and the omentum, intestine, and stomach, or perforation into the stomach or intestine, or externally.

¹ Archiv für klinische Chirurgie, 1899, vol. lviii., p. 470.

² Die Chir. Behand. d. Gallensteinkr., Berlin, 1896.

4. Stones in the common duct, with

- a. Acute obstruction of the duct, or
- b. Chronic obstruction of the duct.

The inflammatory processes in the common duct are essentially the same as those in the gall-bladder, but they are more likely to be followed by :

5. Diffuse cholangitis, thrombophlebitis, abscess of the liver, pyæmia.

CONSERVATIVE OPERATIONS UPON THE GALL-BLADDER. It is not necessary to go into the details of the various operations which have been recommended. Kehr prefers a cystostomy performed at one time if the strength of the patient will allow it. He fixes the gall-bladder to the peritoneum of the wound by silk sutures, tying each stitche over a fine aluminium-bronze wire, in order to prevent the knotted suture from being inadvertently left in the wound when the scissors are passed along the long ends to clip the thread. Often a little pull on this wire loop will loosen and draw out the suture before it is cut. A tube is inserted in the gall-bladder and left for the outflow of bile. When the wound is dressed in this manner it can be left undisturbed for fourteen days. Catgut is used to stitch the gall-bladder to the parietal peritoneum in only those instances in which the bladder easily reaches the wound, and even then four silk sutures are employed, each with its wire loop as above described.

Kehr does not approve of immediate suture of the gall-bladder—cystendysis—the operation which has been spoken of as “ideal.” In the first place it is unnecessary, as shown by the fact that the biliary fistula always closes if there is nothing to keep it open. Moreover, it is not desirable that a fistula should close too soon, as a thorough drainage of the gall-bladder for some weeks is necessary in order to permit the inflammation to subside. It is not surprising that recurrence often follows cystendysis, although it rarely follows cystostomy. The advantage claimed for cystendysis, that it avoids a vicious fixation of the gall-bladder, is also accomplished by cystostomy if Riedel’s “funnel” method is followed or a tube is inserted into the bladder according to the directions of Kehr and Poppert.

Another “ideal” method—the so-called extraperitoneal one—is based on insufficient knowledge of the pathological changes which take place in cholelithiasis. Such attempts to shorten the time of recovery mark a backward step in the operative treatment of this disease.

Fifty-eight of the cases reported by Kehr are examples of conservative operation on the gall-bladder. Among the many lessons which may be derived from their study are the following :

It is sometimes difficult, in spite of long practice, to remove all the stones. Even though bile flows from the gall-bladder when it is opened,

showing that the cystic duct is free, stone may be found at a later date in the biliary fistula. This shows also the advantage of cystostomy rather than cystendysis. In one instance, in which the condition of the patient prevented the opening of the gall-bladder at the first operation, it was evident that the difficulty of extracting all the stones was increased by making two steps to the operation. In two cases the continuance of a mucous discharge showed the presence of a stone. The mouth of the fistula was thereupon dilated and firmly plugged with gauze, and the bile being unable to escape through the fistula collected behind the stone until its force was sufficient to drive the stone through the common duct into the duodenum. This was attended by severe colic, but no bad effects followed. Before trying this method the surgeon must be sure that the gall-bladder is firmly united in the abdominal wall. If the force of the bile will not drive the stone into the duodenum it will be necessary to incise the common duct and remove it. Usually a stone which has been overlooked is small, and can be driven forward in this manner.

At every operation the cystic and common ducts should be thoroughly palpated. If no adhesions are present this may be done without causing the patient much pain. If there are adhesions the palpation is very painful, and hence local anesthesia is unsuitable for a patient under such circumstances. If the palpation of the biliary passages is not carried out the surgeon will often find himself compelled to perform a second operation, as will the man who practices cystostomy in two steps. One cannot be too careful in palpation of the gall-bladder not to drive a stone into the common duct. Kehr's practice is to apply to the cystic duct, before palpating the gall-bladder, a clamp having sufficient power to obstruct the duct, but not to injure its walls.

An acute sero-purulent cholecystitis is a common complication, especially among working people, and is probably the result of traumatism. Usually the peritoneum is more or less affected. An early operation is the proper treatment to prevent the peritonitis from spreading. In these cases cystostomy is better than cystectomy. The latter is a bloody operation and gives an increased risk of infection.

A more chronic form of inflammation is found in the cases in which several stones, lying in the neck of the gall-bladder or in the cystic duct, give rise to recurring attacks of colic on account of periodic swelling of the mucous membrane. In such cases Carlsbad treatment sometimes works striking "cures," which are usually short-lived, permanent relief not being obtained until the stones are removed.

If there is a complication of suppurative peritonitis, thorough washing and free drainage is the best course to pursue. Moreover, the intestine should be quickly emptied by incision and suture at the time of operation and by salts and castor oil on the second day after operation.

A confusion of appendicitis and biliary colic is not uncommon. The pains in the two diseases are not unlike and centre usually about the umbilicus. The constipation, the vomiting, and the character of the fever are not distinguishing marks. If the liver is displaced downward and the gall-bladder is adherent to the colon there will be felt in the cæcal region a mass similar to that felt in appendicitis. If such a patient be examined under an anaesthetic the difference will at once be manifest, and the tumor, which, concealed by the contraction of the rectus muscle, could not be distinguished from a diffuse inflammation, will at once be felt to be discrete and easily mapped off from the other abdominal viscera.

Of the fifty-eight patients upon whom sixty-eight conservative operations were performed three died, one apparently from the effects of poison taken with suicidal intent a few days before.

REMOVAL OF THE GALL-BLADDER. Kehr places special stress upon four points in the removal of the gall-bladder :

1. The cystic duct must be clamped, that no stone may escape into the common duct. This accident may cause colic and a bursting out of the stump of the cystic duct.

2. Cystectomy should only be performed if the common duct is free and the head of the pancreas is not enlarged.

3. The greatest attention should be devoted to the proper care of the stump.

4. The bed of the gall-bladder in the liver and the cystic stump should both be tamponed with gauze.

If these rules are carried out cystectomy is not a dangerous operation, having a mortality of about 3 per cent.

Recently, Kehr inclines more to cystectomy than formerly. In acute cases he prefers cystostomy, but in chronic cases cystectomy, as the latter operation is less likely to be followed by a recurrence, and the removal of the gall-bladder has absolutely no ill effect on the digestive processes. Moreover, if the liver is freely movable, cystectomy is easier to perform than cystostomy. The cystic artery should be separately ligated, and before the cystic duct is divided a ligature should be so placed upon it as to prevent the bile in the gall-bladder from escaping. What bile flows from the common duct can be readily caught up with sponges. For the ligature formalin catgut is preferable to silk. The gauze tampons may be left in place for two weeks. Kehr lost a patient from hemorrhage. The single ligature, placed around the cystic duct and the cystic artery, slipped off. Hence, he advocates their separate ligation. This also enables the surgeon to probe the common duct after a ligature has been placed on the cystic artery. In several instances adhesions were found between the gall-bladder and duodenum or elsewhere. If the strength of the patient permits these should always be attended to.

It is well known that a smooth stone in the gall-bladder, if the cystic duct is free, may give no symptoms whatever ; while in operations upon patients who have suffered severely complications may be found in the form of acute or old inflammatory conditions of the stomach or intestine, which have almost certainly been the cause of most of the pain. Such conditions should be properly treated, a gastro-enterostomy being performed if necessary. Ought the stone in the gall-bladder to be removed under such circumstances, and also when it is found in operations for other purposes ? Kehr does not hesitate to answer both of these questions in the affirmative, for "both the appendix and the gall-bladder exist only for man's annoyance, and when one considers the untold evil which both of these appendages have brought into the world he is not inclined to delay too long in their removal from the body."

Kehr is a firm believer in the good to be derived from the subcutaneous injection of salt solution in conditions of collapse and when peritonitic symptoms appear. Several of his patients were saved by this means.

Cystectomy was performed fifty-nine times, with two deaths.

CHOLEDOCHOTOMY AND DRAINAGE OF THE HEPATIC DUCT. Under this head Kehr groups thirty-two operations, with four deaths. Some of the patients had been previously operated upon, and cystostomy having failed to relieve them of all their symptoms, other stones were sought for and found in the common duct. The abdominal incision under such circumstances was generally made in the median line ; for the primary operations an incision through the belly of the rectus muscle was chosen. Sometimes a stone which is situated deeply in the retroduodenal part of the common duct cannot be extracted with the forceps. A good plan, then, is to make an opening in the duct large enough to admit the left forefinger, which reaches for the stone, while the right hand placed upon the abdominal wall of the patient works with it in loosening the stone from its bed. This manœuvre was several times successful.

In loosening the duodenum so that it may be pushed to the left in order to expose the retroduodenal portion of the duct care must be taken to prevent serious hemorrhage from the branches of the pancreatico-duodenal artery or from some of the irregularly placed veins in the neighborhood. The omentum majus and minus should be divided with blunt instruments and the fingers passed through the openings thus made to explore the head of the pancreas, etc.

The value of proper tamponade with gauze is very great. Those operators who suture a common duct and then close the abdomen without drainage sometimes explain their fatalities as due to the infective character of bile. Were the parts properly drained the patients might

have withstood the limited amount of peritonitis which would have been caused. If this is done and the suture of the common duet gives way—an accident which often happens—no great harm will follow. Indeed, in one case in which both the common and hepatic ducts were greatly dilated Kehr thought it best to pass a closely fitting rubber tube into the hepatic duct, in order to relieve the patient most certainly and quickly from intense cholæmia. The good effect was prompt and continuous. Bile flowed freely from the tube, and the dressings were not even stained. The tube was removed in ten days. Bile began to appear in the stools on the twelfth day, and in four weeks the fistula ceased to discharge any bile at all. Fistulae in the common duct will quickly close spontaneously if the duet is free.

Cholæmia, if of long standing, greatly reduces the resisting power of a patient, and the surgeon ought, therefore, not to delay operation more than three months after the obstruction has become complete. If the stone allows bile to pass it may lie for months in the common duct without giving rise to symptoms, just as it may in the gall-bladder. In case it slips down from time to time and causes obstruction the diagnosis is very difficult.

Attempts to clear out the common duet through the gall-bladder, as recommended by Rose,¹ will rarely be successful. Moreover, such attempts, besides being unsatisfactory, are attended with danger. They mark a step backward in the surgery of the biliary passages.

If the bile is clearly infected so that it "stinks," the common duet should under no circumstances be sutured, but a drain should be placed in the hepatic duct. Whether the patient will recover will depend upon how far the infection has ascended—whether the cholangitis is diffuse or is limited to the larger branches of the hepatic duct.

RESULTS OF OPERATIONS UPON THE BILIARY PASSAGES. From the figures as given above one would infer that the mortality after operations upon the gall-bladder and duets is very low. That is only true of uncomplicated cases. There are many cases in which, on account of complications, the operative effort has to be extended to other than the biliary organs. Kehr puts these operations into a group by themselves, and even in his hands the mortality was over 50 per cent. (43 laparotomies, with 23 deaths). Some of these patients suffered from cancer, and some of them at the time of operation were in an unfavorable condition, not only because of the long continuance of the biliary troubles, but because of gastric or nephritic or other diseases. Note-worthy is the case of a woman upon whom cystostomy, cysticotomy, and cystectomy were successively performed. At the last-named operation

¹ Deutsche Zeitschrift für Chirurgie, 1898, vol. xlix., p. 537.

a part of the common duct was included in the ligature, and a fistula resulted. This made it necessary to perform an anastomosis between the fistulous duct and the duodenum. Six months later a recurrence of icterus, with chills and an enlarged liver, showed that the anastomosis was not doing its work. The plucky woman submitted, therefore, to operation for the fifth time. The stump of the cystic duct was dissected free and implanted in the duodenum. This time the recovery was perfect.

Taking the whole number of operations together, the mortality was 16 per cent. It is, however, evidently misleading to include those cases in which pyloric resection, gastro-enterostomy, or other operations were factors in the death of the patient. Leaving these and the carcinomatous cases out of consideration, the total mortality is reduced to about 4 per cent. Kehr gives it as nothing for early cystostomy ; when the bladder is opened immediately, 3 per cent. for uncomplicated cystectomy and 10 per cent. for choledochotomy.

IS MEDICAL OR SURGICAL TREATMENT INDICATED? This is a question of wider interest than any question of operative technique, for it must be answered by physician as well as surgeon. According to Kehr :

I. Medical treatment, such as a Carlsbad cure, is indicated :

1. In acute stoppage of the choleduct of the usual type. If the attack is prolonged or fever or rapid pulse develops or cholangitic symptoms become prominent, operation should be considered.

2. In inflammatory processes of the gall-bladder, with or without icterus, so long as they do not come too often and are not too severe. It should be remembered that the amount of pain is not always a safe index to the severity of the pathological processes.

3. In frequent attacks of colic accompanied each time by the passage of biliary calculi. If the attacks are often repeated without passage of calculi operation is indicated.

4. In case obesity, gout, or diabetes exists, or cardiae, pulmonary, nephritic, or hepatic conditions make an operation especially dangerous.

5. After a successful operation, in order to cure the patient of the condition which led to the formation of gallstones. Unfortunately, a patient who has been relieved by operation of his acute symptoms will seldom accept advice to submit to a further course of treatment.

Medical treatment has two objects : If the stone sits in the common duct, cholagogues are given to drive it into the intestine. Olive oil, glycerin, salicylate of soda, and ox-gall are some of the remedies made use of. If the stone is in the gall-bladder the whole aim of internal medication should be to allay inflammation and keep the bladder quiet. Cholagogues are contraindicated. In any event the method of a physi-

cian who attempts to drive a gallstone through the narrow passages into the intestinal canal seems more dangerous than the method of the surgeon who takes the stone out through the abdominal wall.

II. Conditions which absolutely demand operation :

1. Acute sero-purulent cholecystitis and pericholecystitis.
2. Inflammatory adhesions between the gall-bladder and intestine, stomach, or omentum, provided that they produce such symptoms as pain, peripyleritis, stenosis of the pylorus or duodenum, ileus, etc.
3. Chronic closure of the choleduct.
4. Chronic closure of the cystic duct, leading to hydrops or empyema.
5. All forms of cholelithiasis which, beginning mildly, nevertheless resist hydrotherapy and internal treatment, and by constant pain and emaciation destroy the patient's pleasure in life and make it impossible for him to pursue his occupation.
6. Suppurative cholangitis and abscess of the liver.
7. Perforation of the biliary tract or peritonitis.
8. Morphine habit due to gallstones. Under such circumstances an operation is the best beginning of a cure of the habit. Numerous successes of this sort have been recorded.

POINTS TO BE CONSIDERED BEFORE OPERATING. It is a mistake to speak of this or that operation as "normal." The operation which fits the case in hand is the best one for it. Very simple operations may be performed with cocaine; otherwise ether, or, still better, chloroform is to be given. The incision of choice is a vertical cut through the right rectus muscle. In secondary operations the hooked incision of Czerny is the best.

If the gall-bladder is relatively sound, stones may be removed from it satisfactorily by cystostomy. The advantages of this operation over cystectomy are its slighter risk and the ease with which one can later perform choledochotomy if necessary. The disadvantages are the fixation of the gall-bladder to the abdominal wall, which is not serious if the technique of the operator is good. A fistula following cystectomy is not a disadvantage, for it is permanent only when the operative efforts have not gone deep enough.

In palpation care should be taken not to push a stone from the gall-bladder into the common duct. All silk stitches used to fix the bladder to the peritoneum should be removed, else they may drop into the bladder and form new caleuli.

A continuous fistula should be plugged to determine whether the common duct is obstructed by a stone. This test will usually serve to decide the question, and will sometimes also succeed in driving the stone into the duodenum. It may be necessary to open the cystic or common duct to remove the stone. If a fistula is quiescent it had better be left alone.

Cystostomy in two steps is indicated only exceptionally when the gall-bladder is shrunken and the patient will not stand any further operative effort. With contracted gall-bladder cystectomy is preferable to drainage with a tube, and the latter is preferable to a cystostomy in two steps.

Cysticotomy is indicated if the stone cannot be pushed back into the gall-bladder. If at the same time the bladder is shrunken it should be excised with the contained stone. If the strength of the patient fails a cysticotomy may be performed in two steps. The rule ought to be, however, to remove all stones at the first operation, if possible. Because one can never be sure of having done this the so-called "ideal" operations are not to be advised.

If the gall-bladder is very thick, cystostomy is preferable to cystectomy. In general it may be said that in acute inflammations cystostomy is indicated, and in chronic ones cystectomy; provided, however, that the common duct is free from stones and the head of the pancreas is not enlarged.

After choledochotomy hemorrhage should be carefully stopped, on account of the danger from cholæmia. A suture should not be attempted if there are technical difficulties, or a stone has been broken, or there is any suspicion of infective processes. Under such circumstances the hepatic duct should be drained, either without or after the excision of the gall-bladder. In all cases the wound should be well drained with gauze. Stones in the hepatic duct are best reached by an incision in the common duct.

Gallstones should never be crushed.

Anastomoses between the gall-bladder and stomach or intestine are to be avoided as far as possible. The duodenum is a better organ for anastomosis than the colon. Murphy's button is not necessary, and it may fall into the gall-bladder and so defeat the object of the operation.

Carcinoma of the gall-bladder may be treated by resection of the bladder and a wedge-shaped piece of the adjacent hepatic tissue, if the disease has not invaded too extensively the liver and the portal glands are not affected. Cancer of the common duct is not likely to be seen at a stage at which operation will be of benefit.

In perforative peritonitis, if the strength of the patient will permit, the opening should be sutured and cystostomy performed, or the bladder should be excised. In either case the parts should be well drained with gauze. If the peritonitis has extended still further, gauze drainage should be used elsewhere in the abdomen. Normal salt solution should be freely injected subcutaneously.

An abscess of the liver due to cholelithiasis should be opened and drained. Multiple diffuse purulent cholangitis is not amenable to surgical treatment.

In the after-treatment the surgeon's attention should be directed to the condition of the stomach (acute dilatation), intestine (kinking, paralysis), the lungs (right-sided pneumonia), to secondary hemorrhage, the stump after cystectomy, chokemia after choledochotomy, etc. The patient should be seen every two hours for the first day. The bowels should be moved in five days or less by castor oil. The dressing should be changed in two weeks, and the patient allowed to get up in from two to four weeks.

If the stomach kinks at the pylorus and vomiting is not relieved by lavage, gastro-enterostomy should be performed. Vomiting of blood is an indication of a grave disturbance of the portal circulation, but is not a surely fatal sign. Treatment should consist of absolute abstinence, saline injections, lavage of the stomach with 2 per cent. soda solution, or ice-cold 1 per cent. solution of nitrate of silver, and nutrient enemata containing ergot.

If the gall-bladder, fixed to the abdominal wall, is the seat of pain, it should be loosened and sunk. This can usually be done extraperitoneally.

If a gall-bladder has been the seat of a severe inflammation it is a good practice to drain it for at least six weeks, washing it out from time to time. Small stones will thus be obtained which were hidden away in folds of the mucous membrane, though it seemed to the operator that none were left.

Petersen¹ makes a report of 179 operations performed for gallstones at Czerny's clinic. There were 24 deaths, 12 of them occurring in cases complicated with carcinoma. The list includes all the patients operated upon, no matter what complications were present. The mortality from the different operations is not materially different from Kehr's. The uncomplicated operations performed since 1895 (68 in number) had a mortality of only 3 per cent.

Cholecystostomy performed at one time is the operation of choice. Cystendysis has been given up. Cystectomy is performed only if the gall-bladder is much changed in character or excites suspicion of cancer. Drainage of the gall-bladder is most important, as it allows infected bile to become sterile.

Haasler² cites the histories of eighteen patients operated upon since 1890 in the clinic at Halle for stone in the common duct. Only two of them died, one from suppurative cholangitis and pericholangitis, with abscesses of the liver existing at the time of operation, and the other from secondary hemorrhage. The other patients all did well, excepting

¹ Beiträge zur klinische Chirurgie, 1899, vol. xxiii., p. 705.

² Archiv für klinische Chirurgie, 1899, vol. lviii., p. 289.

that in one instance there was a recurrence of the calculi. Haasler's practice is to suture the wound in the duct and to close the abdominal cavity whenever there are no evidences of acute inflammation. If there is even a slight amount of inflammation the wound should be thoroughly drained and tamponed.

In every instance the incision in the abdominal wall was made parallel to the costal margin, nearer to the ribs when the liver was small, further away when it was larger. If more room was needed it was obtained by a vertical supplementary incision. This oblique incision heals as perfectly as a vertical one, and affords an unusually good view of lesions which are often complicated.

Treves¹ mentions three cases in which a movable kidney produced all the symptoms of gallstones—that is, attacks of hepatic colic followed by jaundice. These were apparently due to pressure upon the bile-ducts caused by the displaced kidney. In two cases the pressure was upon the cystic duct and in one case upon the common duct. The diagnosis was concurred in by all the physicians and surgeons who saw these patients. All three patients were operated upon, and in none of them were there any gallstones. The kidneys were sutured in place, and the attacks of biliary colic did not recur.

EXPERIENCE OF AMERICAN SURGEONS. Several comprehensive papers by American authors upon the surgical treatment of gallstones appeared last year. The combined experience of these authors falls far short of that of the German surgeon Kehr, and, as the writers all quote his ideas, no excuse is needed for the extensive *résumé* of his article, to which space is here given.

Ransohoff² regrets the difficulty of an exact diagnosis. Biliary colic is apt to be mistaken for biliaryness, dyspepsia, cardialgia, renal colic, appendicitis, intermittent fever, intestinal obstruction, pleurodynia, and, most frequently of all, for gastric catarrh. Riedel, who has had an enormous experience, attributes colic to inflammation—not to the passage of a stone—but few will agree with him. Jaundice is a most unreliable symptom of obstruction.

In his operative methods Ransohoff follows Kehr closely. He believes that one reason why a fistula persists for a long time after cholecystostomy is that the bladder is sutured too near the surface of the wound, even to the skin instead of to the parietal peritoneum alone. Cholecystenterostomy should be reserved for cases of obstructive jaundice from malignant disease or impermeable cicatricial stenosis of the common duct.

¹ Lancet, 1900, i., p. 15.

² Journal of American Medical Association, 1899, vol. xxxiii., p. 688.

McCosh¹ inclines to Riedel's view, that colic is caused by inflammation rather than by the passage of a stone. The inflammation is due to stone in probably 90 per cent. of the cases, but it is the inflammatory process and its complications rather than the stone which produce the severe symptoms. Distention of the gall-bladder will often take place when the cystic and common ducts are entirely free from stones, and not only will the usual symptoms which are generally attributed to the passage of a stone, such as colicky pain and vomiting, be thus produced, but also those of graver character, such as chills, fever, and jaundice, and death even may result without the impaction of a stone.

McCosh denounces the evils of delaying operation until the patient's health is gone. To quote his own words: "I fancy that many of the surgeons here present have with difficulty been able to conceal their indignation when, after weeks—yes, months—of so-called 'watching,' a patient, semicomatose, with high fever, with urine loaded with albumin, and lacking in any reparative or resisting power, has been handed over to him for operation."

Murphy² says that cases in which there is immediate danger are those in which there is (1) a primary attack with a virulent or malignant infection of the gall-bladder; or (2) acute obstruction and infection of the common duct. In such attacks there is sudden pain, high temperature, and vomiting. If the cystic duct is obstructed there will be great tenderness, but less spasmody pain. If the common duct is involved there will be no tenderness, but great pain and jaundice, with sepsis and obstruction of the cystic duct. Gangrene of the gall-bladder may be produced in three days. Murphy mentions two cases in which this took place, the attack being, moreover, a primary one. If the infection and obstruction take place in the common duct it will rapidly spread through the branches of the biliary passages and lymphatics, and with chills and fever and delirium the patient will rapidly succumb. The quickest, simplest, and most effective operation in either case is cholecystostomy. The drainage of the gall-bladder relieves the vicious tension in the biliary passages, and there will be a rapid subsidence of the symptoms mentioned.

Richardson³ says that mortality after operations for gallstones is more dependent on the time of operating than on the operation itself. The absence of facets is no proof that a stone was a single one. He once removed from a patient ten stones, no one of which was faceted. A history of intermittent colic associated with jaundice almost certainly points to gallstones, yet it should not be forgotten that in appendicitis the pain may be confined to the epigastrium. In all cases in which

¹ Journal of American Medical Association, 1899, vol. xxxiii., p. 694.

² Ibid., 1899, vol. xxxiii., p. 700.

³ Medical News, 1899, vol. lxxv., p. 698.

there is good reason to believe gallstones are present operation should be performed. The dangers of exploratory laparotomy are less than those of delay.

The surgeon should look out for hemorrhage from the mucous membrane of a distended gall-bladder. For a number of years Richardson operated so successfully in cases of jaundice that he was disposed to ridicule those who are so fearful of hemorrhage under such conditions. A fatality from uncontrollable capillary bleeding taught him to respect their timidity.

The prevailing opinion among the surgeons of the Massachusetts General Hospital, of Boston, is that it is dangerous to close immediately the gall-bladder and abdominal wound.

Weir¹ believes in leaving the gall-bladder open. If the common duct has to be opened the incision should be made at its upper part, where there is no danger of wounding the portal vein. It is difficult to suture the common duct, even with the special appliances which have been suggested (Lane's needle-holder, Halsted's hammers, etc.). In his last six cases he left it open without bad result. When a stone has been removed from the common duct it was formerly his practice to pass a sound to determine if the lumen was free. Lately, to avoid possible infection by the sound in its withdrawal, he injects water into the duct, using a long, slim syringe for the purpose.

McBurney² does not advise operation in elderly people, who do not stand operation well, nor in fat people, whose thick abdominal walls make manipulation difficult, unless the symptoms are unbearable. Otherwise the earlier the operation is done the better. Biliary fistulæ can be best avoided by adopting a method advocated by Jones, who inverts the coats of the gall-bladder so that the peritoneal surfaces come together. The incision then closes prettily. When stones are in the common duct he prefers to open the duodenum and take them out through the papilla, thus avoiding the danger of hemorrhage from a wounded portal vein.

Halsted³ has recently reported a number of successful operations for the removal of stone in the common duct, seven in all. Six of the patients recovered from operation, although in some instances the large cirrhotic liver, the dry, slate-yellow skin, the enfeebled intellect, and the body emaciated to the last degree seemed to preclude all hope of recovery. One of the patients died in a few months from extension of carcinoma. The only patient who died immediately after operation was one in whom a pyloric ulcer had given rise to a dissecting submucous abscess. This abscess was accidentally punctured by a needle during the operation,

¹ Medical News, 1899, vol. Ixxv., p. 699.

² Ibid.

³ Johns Hopkins Hospital Bulletin, 1900, vol. xi., p. 1.

and a fatal peritonitis resulted, although literally only a drop or two of fluid escaped, and these were carefully wiped away. All of the uncomplicated cases recovered.

Hoegh¹ says that it is of the greatest importance that sufferers from gallstones should be operated upon early, before the stones which form in the bladder have passed into the ducts or produced inflammation in adjacent organs. To accomplish this, physicians must learn that only a few attacks of gallstone colic are accompanied with jaundice; the public must learn that early operative relief is a comparatively simple procedure; surgeons must separate their malignant and benign cases, so that the mortality which properly belongs to cancer may not be ascribed to gallstone.

Abscess of the Liver. Jackson² looked up in the records of the St. Paul hospitals seventeen cases of abscess of the liver, and found the causes of the abscess to be as follows:

Empyema	1
Ulcer of the stomach	1
Indefinite	3
Amœbic dysentery	2
Appendicitis	10
Total	17

The fact that the abscess was attributable to appendicitis in so large a number of cases is rather surprising. In four instances the connection seemed perfectly clear, in the other six it was somewhat doubtful. An analysis of the chief symptoms in these cases gives the following data:

In seven cases there were repeated chills, occurring at irregular intervals and often accompanied by vomiting. Fever, usually of a high grade, was present in fourteen cases. There was extreme variation in the temperature independently of rigors, and sometimes within an hour the change in temperature would be considerable.

Delirium was rare, mild in character, and usually seen late in the disease.

In eight cases the pulse was given as slow, and in only three was it said to be rapid. This fact is of importance, because a slow pulse may easily be mistaken for a favorable symptom, and thus tend to delay operation.

In every case the liver was enlarged, extending well below the ribs, or even to the umbilicus. Enlargement increased rapidly, so that it could be observed to increase from day to day.

Vomiting was observed in only two instances.

Pain and tenderness were usually absent and were never severe. Leucocytosis was present in the only five cases in which the blood was

¹ Medical Dial., 1899, vol. i., p. 159.

² St. Paul Medical Journal, 1899, p. 401.

examined. Jaundice was present in six cases, but was of slight degree. The spleen was enlarged in eight cases.

Aspiration of the liver is by no means a satisfactory method of diagnosis, as the abscess cavity may not be reached by the needle. Early and free incision is the only rational treatment. Only two of the ten patients recovered.

Echinococcus of the Liver. The lesions produced by this parasite are most often found in the liver. Though they are rare in America, they occur often enough to have caused the chagrin of most surgeons of experience, for just because echinococcus cysts are not common their diagnosis and treatment is too generally overlooked.

At the Latin-American Congress held in Buenos Ayres in 1898, Posadas¹ reported fifty-eight operations which he had performed for echinococcus in the three years previous. In thirty-six instances the disease was in the liver. He rejects altogether treatment by injection, and makes use of drainage only in the presence of suppuration. His usual method of treatment was the shelling out of the cyst and the suture of its cavity as well as of the abdominal wound. In fifty-three cases this plan was followed, forty-eight times with a perfect result. Suppuration resulted five times, making drainage necessary. In one case peritonitis and death followed the suppuration. Two patients died later of cysts in other organs.

This is the method of treatment which was advocated by Bobrow² in a paper read by him at the Moscow Surgical Society in 1897 and published the following year. Formerly the idea was entertained that the cavity left after the cyst and its capsule are shelled out must either be stitched in the wound (marsupialization), or else must be filled with some antiseptic or indifferent solution (iodoform emulsion, salt solution), in order to prevent it from filling up with bile or serum. Experience has proved this fear to be groundless. If a cyst is emptied aseptically and sutured, repair may be complete in two weeks.

Garre³ followed Bobrow's method in the treatment of three cases of very large cyst of the liver. Although in two of the cases it was impossible to remove all of the sac, the cavity was closed and healed *per primam*. In the third case a fistula formed, but the patient was able to leave the hospital in four weeks.

It is interesting to compare these results with those obtained by Körte,⁴ who operated upon sixteen patients. In eight of them the cysts were suppurative; in four there were more than one cyst; in one

¹ Centralblatt für Chirurgie, 1899, p. 1234.

² Archiv für klinische Chirurgie, 1898, vol. Ivi., p. 819.

³ Beiträge zur klinischen Chirurgie, 1899, vol. xxiv., p. 227.

⁴ Ibid., 1898, vol. xxiii., p. 253.

there had been a discharge of daughter cysts through the intestine, and ieterus had been observed in eight patients. The operation in each case was performed in one step, and consisted of free opening of the sac after suture of the two peritoneal (pleural) surfaces. If the overlying layer of liver tissue was more than 1 cm. (0.4 inch) thick it was divided by a thermo-cautery. The sac was emptied of its contents, and in it were placed two large drains for subsequent irrigation. Three of the sixteen patients died, and the after-treatment was tedious in every instance. Twice capillary hemorrhage occurred, and four times a persistent discharge of bile. In the opinion of this author this last complication is only to be avoided by leaving the fibrous capsule of the cyst intact. The treatment must be continued until the sac fills with granulations, and remedies to stimulate their growth should be employed. A fistula may be cured by making an anastomosis with the gall passages, as was done in one case with success.

In his lectures on clinical surgery Delbet¹ strongly advocates Bo-brow's principles of treatment. His plan of operation, which he calls "capitonnage"—a word which is not found in any of the ordinary French dictionaries—consists in emptying the sac and reducing its cavity as much as possible by a partial resection, followed by suture of its walls. The edges are either turned over and stitched, or a Lembert suture is applied, and the abdominal wound is closed completely. In one instance a biliary duct opening into the cyst cavity was successfully closed by suture. This operation is contraindicated in the presence of suppuration or calcification of the cyst wall. Delbet has carried it out successfully seven times, thereby avoiding the prolonged convalescence, fistula-formation, and eventration which follow marsupialization of the sac.

In a recent discussion of this subject at the Society of Surgery of Paris, Terrier² and Bruns³ supported Delbet's statements, and cited cases in which successful operations had been performed. Potherat⁴ thought that the after-effects of marsupialization were not fairly presented, but that the evils mentioned were due to suppuration and not to the method of treatment, which if carried out antiseptically will sometimes cure a patient in three or four weeks. Bazy thought that immediate suture exposed the patient to the risks of secondary infection.

The diagnosis of an echinococcus cyst is fairly easy if the cyst occupies the anterior or lower portions of the liver. If it is situated in the upper or posterior portions of the liver its recognition is more difficult. It is pretty generally agreed that puncture of a cyst for diagnostic purposes is an unwise measure. In order to get sufficient fluid for a posi-

¹ *Leçons de Clin. Chirur.*, Paris, 1899.

³ *Ibid.*, 1900, p. 8.

² *La Semaine Médicale*, 1899, p. 30.

⁴ *Ibid.*, 1900, p. 31.

tive diagnosis a large needle is often necessary, while a puncture with even the finest needle may lead to fatal peritonitis. The injection of bactericidal fluids as a means of cure is only allowable if the cyst is well shut off from the peritoneal cavity and is not sufficiently accessible for incision. Garre¹ reports the successful cure in this manner of a cyst in the pelvis intimately adherent to the rectum.

Surgical Treatment of Ascites. Successful attempts to cure by surgical measures ascites due to cirrhosis of the liver have been reported by Morison,² Talma,³ Neumann,⁴ and Turner.⁵ These and other surgeons have also reported failures, while in some instances the operation has been followed by death.

The end sought has been the establishment of new routes by which the portal blood shall reach the systemic veins without passing through the cirrhotic liver. Experiments performed years ago by Eck showed that a direct anastomosis between the portal vein and the vena cava caused almost immediate death of the animal operated upon, so that surgeons have been careful not to make a free anastomosis, but to relieve the portal circulation very gradually by setting up adhesions between the peritoneum of the liver, omentum and spleen, and the parietal peritoneum. Sappey demonstrated the normal existence of connections between the portal and systemic circulations through veins running in the hepatic and coronary ligaments. These small veins sometimes become much dilated in ascites, and, together with adhesions set up by repeated tappings or by inflammation, they may so relieve the abdominal stasis as even to effect a cure. In order to assist nature Morison scrubbed with a sponge the surfaces of the liver and spleen and the opposed parietal peritoneum, and stitched the omentum to the anterior abdominal wall. He reported partial or complete success in three cases. A fourth patient so operated upon was not at all benefited by the operation, but it was doubtful in his case if the ascites was due to hepatic cirrhosis.

Talma performed three operations upon his patient, a boy, aged nine years. At the first laparotomy the wound was left open for drainage. At the second the omentum was stitched broadly into the wound. At the third the spleen was brought out of the peritoneal cavity and tucked into a pocket made by dissecting the skin and subcutaneous fat from the abdominal muscles. The result was satisfactory.

Neumann's patient was a woman, aged forty-five years, of alcoholic

¹ Beiträge zur klinischen Chirurgie, 1899, vol. xxiv., p. 227.

² Drummond and Morison. British Medical Journal, 1896, ii., p. 728, and 1899, ii., p. 1424.

³ Berliner klinische Wochenschrift, 1898, p. 833.

⁴ Deutsche medicinische Wochenschrift, 1899, p. 422.

⁵ Rolleston and Turner. British Medical Journal, 1899, ii., p. 1679.

habit. There were no visible cutaneous veins about the umbilicus. The abdomen was opened in the median line. The liver was large, smooth, and hard; the peritoneum appeared normal; the spleen was also enlarged. The peritoneum on either side of the abdominal wound was lightly scraped with a curette, and the omentum was stitched to it and into the wound. Ten days later there was a certain amount of ascitic fluid in the abdomen, but superficial veins about the umbilicus were plainly visible. In six months, without further tapping, the ascitic fluid had all disappeared and the patient was in fairly good health. The umbilical veins were then much enlarged.

Turner scraped the upper surface of the liver and the opposing peritoneum, and then brought the omentum between them and stitched it there. His patient was a man, aged forty-five years, whose ascites was of a few weeks' duration, and had never been treated by tapping. There was no recurrence of the ascites, but the splenic enlargement persisted. He also reported a failure in a man aged fifty-two years, in whom the ascites had existed ten weeks. The ascites returned, so that he had to be tapped again and again.

Weir¹ operated upon a man, aged thirty-nine years, of alcoholic habit, who had been tapped several times in the preceding two months and who was rapidly failing in health. He found the liver enlarged and rough. He scraped it freely with a steel hat-pin, stopping the bleeding with temporary pressure of gauze. The parietal peritoneum over the liver and at the sides of the abdominal incision was also scraped, and the omentum was sutured to the anterior abdominal wall. Suprapubic drainage was carried out through a second incision. The patient died on the fifth day. The peritoneal fluid contained streptococci, *coli* *baeilli*, and also scolices. The liver contained an echinococcus cyst of fair size. Weir does not think the infection was introduced from without at the time of operation, but that it may have come from scratching the liver, or from the scolices, or from the pelvic drain.

This makes a total of eight cases in which operation was performed for ascites, with results as follows: Five patients were cured or much improved; two were not benefited by the operation, and one died of infection.

THE DIAGNOSIS OF ABDOMINAL TUMORS.

M. L. Harris² says that one of the greatest helps in the diagnosis of abdominal tumors has been generally neglected. The mesocolon naturally divides the abdomen into four spaces—a right and left lateral,

¹ Medical Record, 1899, vol. Iv., p. 149.

² Journal of the American Medical Association, 1899, vol. xxxii., p. 335.

a supracolic, and an infracolic or central space. The distention of the colon will at once show in which region a tumor is situated and

FIG. 24.

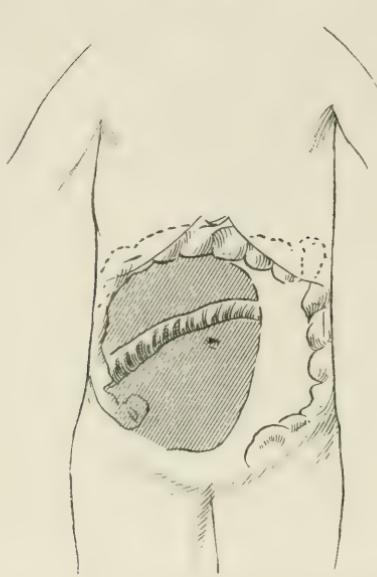


Fig. 24.—Solid tumor of mesentery. (HARRIS.)

FIG. 25.

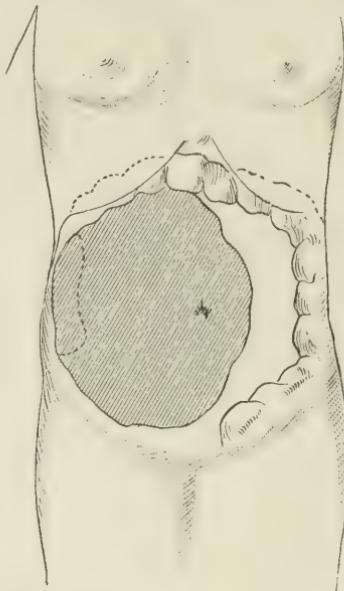


Fig. 25.—Multilocular ovarian cystoma, with long pedicle. (HARRIS.)

FIG. 26.



Extra-uterine pregnancy, developing in the left broad ligament. (HARRIS.)

whether it lies in front of or behind the colon. For distention air is better than fluid of any kind. The only apparatus required is the double

rubber bulb of a hand atomizer to the tube of which is attached a hard-rubber tip. If the patient finds difficulty in expelling the air, a soft rectal tube may be passed. Air is superior to fluid, as the latter often causes pain, and the colon is not so easily mapped out when filled with fluid as when filled with air. Before the air is pumped into the colon the bowels should be thoroughly moved and the outline of the tumor plainly marked on the surface of the abdomen.

Tumors of the Central Area. A list of tumors of the central area includes solid and cystic tumors of the omentum and mesentery, retroperitoneal tumors, echinococcus cysts, circumscribed peritoneal exudates, tumors of the small intestine, tumors of movable kidneys, and all tumors of the female generative organs that rise into the abdominal cavity. Figs. 24, 25, and 26 are illustrations of tumors in the central areas and how the distention of the colon aided in their diagnosis may be readily observed.

Tumors of the Supracolic Area. In the supracolic region are found tumors of the liver, gall-bladder, stomach, lesser omentum, pancreas, retroperitoneal lymph-glands, etc. Many mistakes in diagnosis may be avoided by simple colonic distention. For instance, the records show that nearly every pancreatic cyst in the female upon which operation has been performed has been mistaken for an ovarian cyst. The determination of the relation of the colon to the tumor almost always distinguishes between them. Sixty-three cases have been reported in such a manner as to furnish available material for the solution of this question. In thirty-four of these the colon was carried downward; in seven it lay across the tumor; while in only three cases did the colon pass along the upper margin of the tumor. In nineteen cases the relation of the colon to the tumor is not stated, but the description of the operation makes it fairly certain that it was displaced downward. Even in the 5 per cent. of cases in which the tumor lies below the colon the firm attachment of the colon to the upper border of the tumor ought to suggest a tumor growing behind the colon rather than one from below simply pushing the colon upward.

Tumors of the Lateral Areas. In the right and left lateral areas external to the mesocolon are found tumors of the kidneys, rare cysts of lymphatic origin, tumors of adrenals, and, possibly, tumors originating in remains of Wolffian bodies.

Most renal tumors displace the colon forward or forward and inward. Exceptions to this rule occur, as shown by Figs. 37 and 39 and by other cases quoted by Harris. These exceptions are too rare, however, to materially lessen the value of the colonic displacement as a diagnostic point of renal tumors. Moreover, there are a few retroperitoneal or

pararenal tumors, which, growing from the vicinity of the kidney, naturally displace the colon in the same direction as would a renal tumor.

FIG. 27.

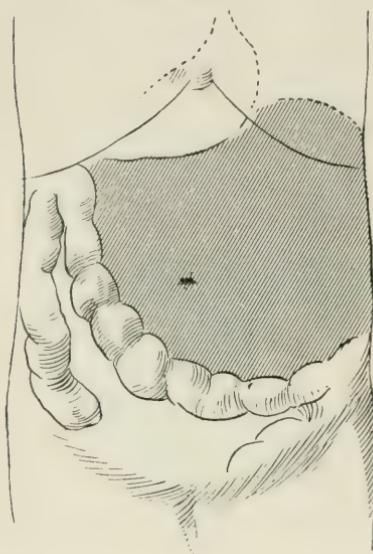


FIG. 28.

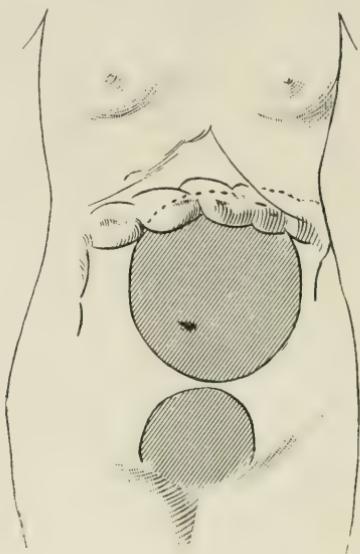


Fig. 27.—Pancreatic cyst, usual position. (HARRIS.)

Fig. 28.—Pancreatic cyst, position in 5 per cent. of cases; pregnant uterus. (HARRIS.)

FIG. 29.



FIG. 30.

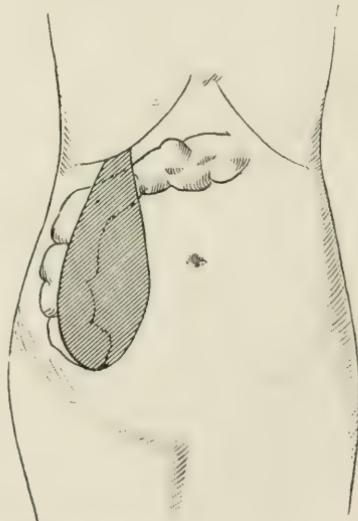


Fig. 29.—Carcinoma of stomach. (HARRIS.)

Fig. 30.—Distention of gall-bladder. (HARRIS.)

FIG. 31.

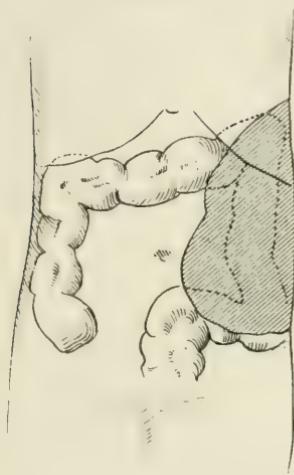


FIG. 32.

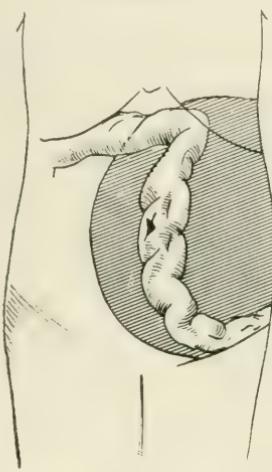


Fig. 31.—Enlarged spleen. (HARRIS.)

Fig. 32.—Sarcoma of kidney. (HARRIS.)

FIG. 33.



FIG. 34.

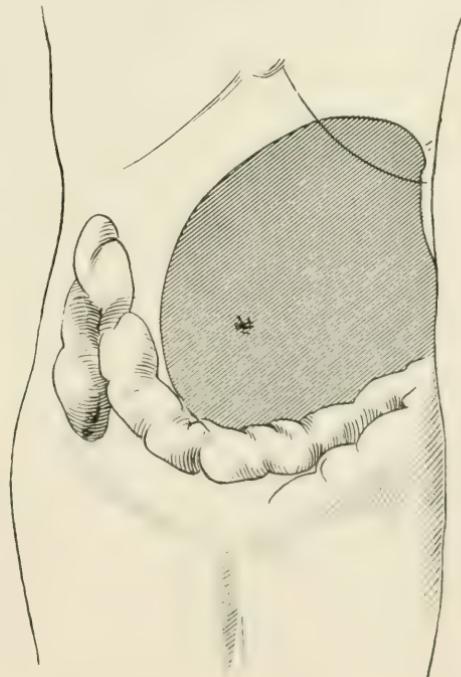


Fig. 33.—Pararenal cyst. (HARRIS.)

Fig. 34.—Lymph cyst of hilus of left kidney. (HARRIS.)

FIG. 35.

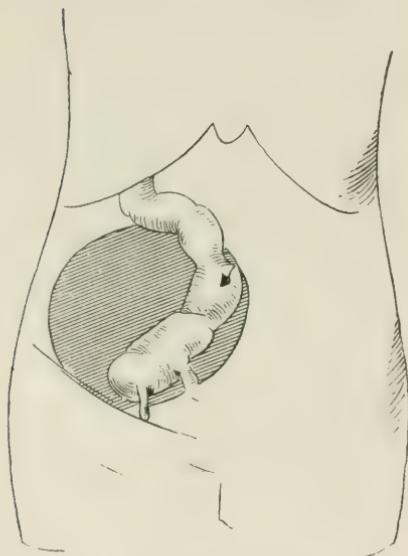


Fig. 35.—Hydronephrosis. (HARRIS.)

FIG. 36.



Fig. 36.—Hydronephrosis mistaken by operator for ovarian cyst. (HARRIS.)

FIG. 37.

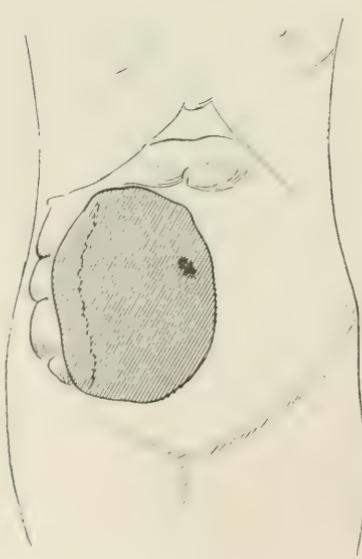


Fig. 37.—Hydronephrosis in movable kidney. (HARRIS.)

FIG. 38.

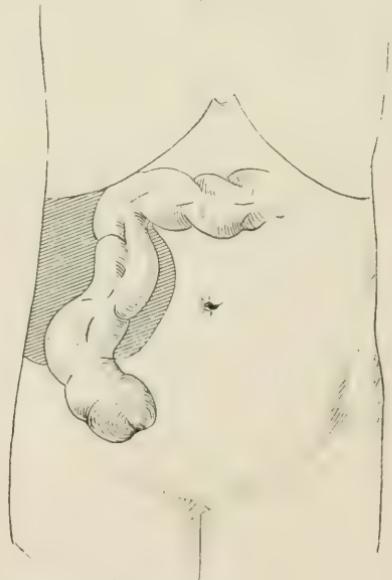
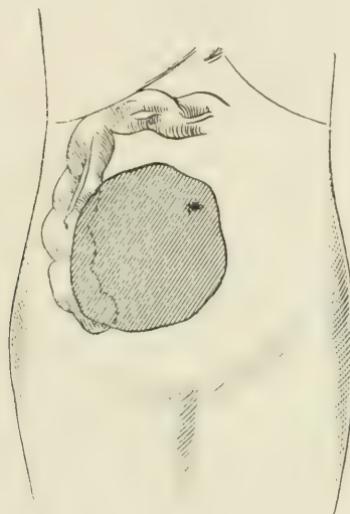


Fig. 38.—Pyonephrosis and perirenal abscess. (HARRIS.)

These are minor points which need careful study. The value of Harris' article lies in his emphasis of :

1. The great importance, clinically and diagnostically, of the subdivisions of the abdominal cavity as here outlined.

FIG. 39.



Pedicled adenocarcinoma kidney. (HARRIS.)

2. The characteristic relation of the colon or some part of it to most intra-abdominal tumors, an accurate knowledge of which is of greater diagnostic importance than any other single point.

DETECTION OF ABDOMINAL CALCULI BY THE X-RAYS.

Soon after Röntgen announced his discovery of the X-rays attempts were made to utilize them in the diagnosis of calculi in the biliary or urinary passages. The first trials of this sort were often failures, and for a time it looked as if a diagnosis of calculi by this means could never be made with certainty. Experiments soon showed, however, that all calculi are not to be classed together, but that those composed of calcic oxalate obstruct the rays fairly well, while those composed of phosphates are more easily penetrated, and pure uric-acid or uratic calculi cast even a fainter shadow. There seemed to be some ground for hope that a stone containing a large proportion of calcic oxalate might be made to show in a radiograph, but most investigators considered this the practical limit of radiography of calculi. For example, last year, at the annual Congress of the German Surgical Society, Ringel¹ stated the conclusions

¹ Archiv f. klinische Chirurgie, 1899, vol. lix., p. 167.

which he had drawn from his own personal experiments and those of other men in the following terms :

1. Röntgen's method is capable of showing the presence of calculi in the kidney with certainty only if they are composed of calcic oxalate.

2. The demonstration of other kinds of renal calculi that offer less obstruction to the Röntgen rays takes place only under exceptionally favorable circumstances, the stone being very large or the patient himself offering little obstruction to the rays.

3. Röntgen's method is to be tried in every case in which it may be of assistance in clearing up a diagnosis. Only a positive result should be considered conclusive, since the absence of the shadow of a calculus in the negative is no proof that the kidney does not contain a stone.

FIG. 40.



Oxalatic calculus in the left kidney. (RINGEL.)

Since the phosphatic calculi are by far the most common, occurring in his observation eleven times, while uratic and oxalatic calculi occurred each three times, the field for the use of the X-rays would seem to be a narrow one. Within these limits Ringel had some success, as the accompanying illustrations (Figs. 40 and 41) show :

This was not the first success that was reported by any means. Other men had obtained radiographs of calculi under even less favorable conditions. Taylor and Fripp¹ were able to locate by a radiograph a renal

¹ *Lancet*, 1898, i., p. 1534.

calculus which had escaped detection by a lumbar nephrotomy. Symptoms of calculus had lasted for nine years. When the stone was finally located the operator was compelled to resect a portion of the twelfth rib before he could extract the stone, which was said to be of the size and shape of the distal segment of a small thumb.

C. A. Morton¹ removed an oxalatic stone, measuring $\frac{3}{4} \times \frac{1}{2}$ inch, from the left kidney of a boy aged twelve years, after radiographs taken on two different occasions had shown its presence on a level with the

FIG. 41.



Large phosphatic calculus in the right kidney. (RINGEL.)

twelfth rib. The patient had suffered from intermittent attacks of pain and haematuria for a year previous.

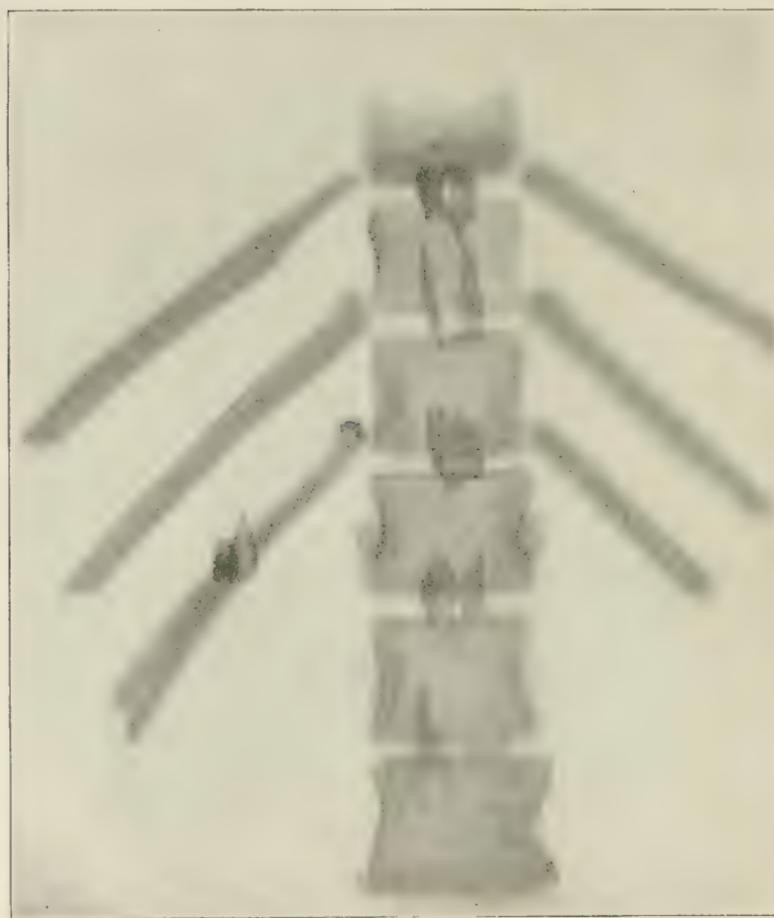
Occasionally a successful radiograph has been obtained of a smaller stone. Abbe² prints a drawing made from such a radiograph in which the stone was clearly outlined, although its greatest diameter was only half an inch. It was composed of calcic oxalate. The time of exposure was one minute.

¹ British Medical Journal, 1898, i., p. 1136.

² Annals of Surgery, 1899, vol. xxx., p. 178.

It is certain that the details of radiography will be worked out so that the results in the future will far surpass those which have hitherto been obtained. The time of exposure has usually been too long. This makes little difference when an absolutely impervious object, such as a bullet or a Murphy's button, is to be shown ; but when a uratic or phos-

FIG. 42.



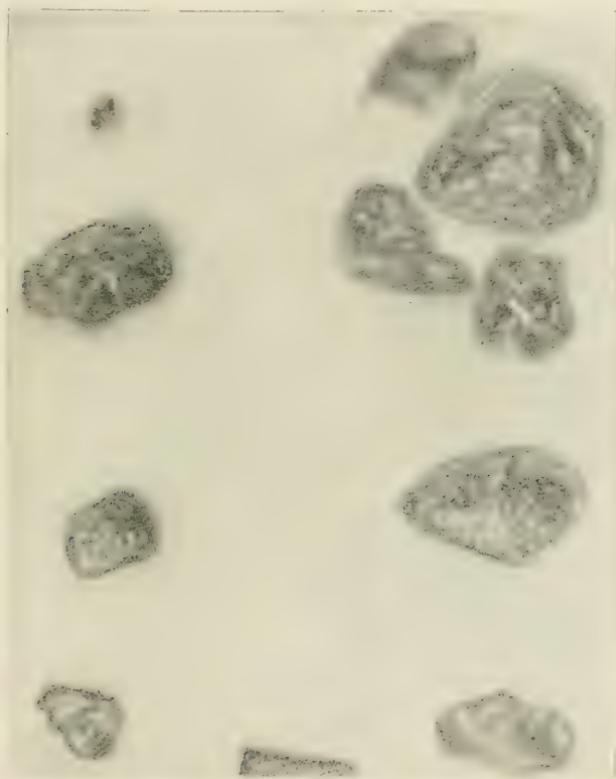
Drawing from radiograph showing oxalate stone in kidney. (ABBE.)

phatic calculus is sought for whose penetrability is only slightly less than that of muscle, or kidney, or bladder, it is essential that the exposure should not be too long.

With pardonable pride one turns from the results obtained by German and English investigators to view the successes of an American in this

field. Nearly two years ago Leonard,¹ of Philadelphia, stated as an axiom "that if rays are employed that will differentiate between the shadows of tissues less dense than the least dense calculus, all calculi will be found." If this is true, then if no calculus is shown in the negative none exists, and the negative diagnosis becomes as certain as the positive one.

FIG. 43.



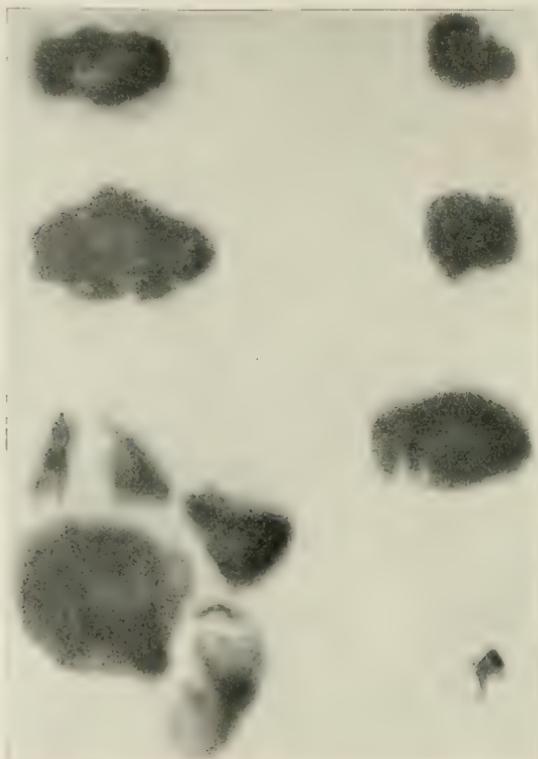
Radiograph of calculi taken by low vacuum Röntgen discharges. (LEONARD.)

The production of negatives having these details is secured by the employment of a large volume of Röntgen discharge from what Röntgen terms a "soft" tube—*i. e.*, one having a low vacuum. Experience in lumbar and pelvic pictures has shown that the requisite vacuum is equivalent in resistance to one or two inches of spark in air, as measured by a parallel spark-gap. The length of exposure also varies with the individual. High wattage, and not high voltage, is necessary to differentiate the soft structures of the loin. If a negative is obtained

¹ Philadelphia Medical Journal, 1898, vol. ii., p. 388.

in which differentiation is visible between the shadows of tissues less dense than the least dense calculus, a certain conclusion as to the presence or absence of a calculus can be drawn. At a later date Leonard¹ published results of this method. Figs. 43 and 44 show the relative penetrating power of high and low vacuum Röntgen discharges. In all other respects the conditions under which the plates were exposed and developed were the same.

FIG. 44.



Radiograph of calculi taken by high vacuum Röntgen discharges. (LEONARD.)

By following these principles Leonard has twice succeeded in getting a radiograph of a small calculus in the ureter near the bladder. In a more recent paper on this subject Leonard² claims for his method of examination the following advantages :

" Mathematical accuracy, positiveness, and comprehensiveness. The early period at which the diagnosis is made, and the consequent early operation, decreases the mortality and prevents partial destruction of the

¹ Philadelphia Medical Journal, 1900, vol. v., p. 50.

² Annals of Surgery, 1900, vol. xxxi., p. 163.

kidney. It avoids the dangers and pains attendant upon exploratory operations and gives a more definite diagnosis. The detail secured facilitates operation and insures its completeness. The examination of both kidneys and ureters localizes the operative interference, prevents operation on the wrong kidney, or unwitting operation on either when both are the seat of calculous disease. Impacted or quiescent calculi in the pelvis of the kidney, its calices, or in the ureter are detected if only suspected. The absolute negative diagnosis renders rational a non-operative treatment that would otherwise often endanger the life of the patient. It is especially in cases of anuria, either partial or complete, that the exact localization of the impacted calculus is of the utmost importance. If it remains, in partial anuria the function of the affected kidney is destroyed, and so insidiously that it is impossible to distinguish destruction from recovery. Complete anuria is readily recognized, but the exact localization of the calculus and its immediate removal are essential to recovery."

Leonard gives details of fifty-nine cases in which examination was made by him. The diagnosis of "calculi, single and multiple, was in eight cases confirmed by operation. In one other case a small ureteral calculus was passed, and two other ureteral calculi were shown to be present by subsequent skiographs, although the age and condition of the patient did not permit operation. In one case the patient refused operation and left the hospital. In all of the seven cases of negative diagnosis in which subsequently nephrotomy, nephrectomy, or nephorrhaphy was performed, the correctness of the diagnosis was confirmed, with one exception, and then the error was due to faulty technique. Of the fifty-nine patients examined twelve were found to be the subjects of calculous disease."

Perhaps the most beautiful radiograph of a renal calculus ever published was taken by Albarran,¹ and is here reproduced (Fig. 45). In it one can plainly see not only the muscular structures of the loins, but the curved outlines of both kidneys, in whose pelvis were phosphatic calculi. The left kidney (left side of the picture) contained more and larger calculi than the right. It was, therefore, opened first and the calculi were removed. They were found to be composed of almost pure phosphate of calcium. At the time of the report the right kidney had not been operated upon.

The accuracy of the radiograph is seen if one compares it with the photograph of the calculi of the left kidney after their extraction. (Fig. 46.)

It is, perhaps, of less importance to show a vesical calculus by X-rays

¹ *Annals des maladies des organes gen.-urinaires*, 1899, p. 673.

than it is to show a renal calculus in this manner, since the diagnosis of vesical calculus can usually be made in other ways with a fair degree of

FIG. 45.



Radiograph taken with low vacuum tube, showing calculi in both kidneys.
(ALBARRAN.)

certainty. Still, there are instances in which the confirmation or rejection of a diagnosis by painless means has a great value. Sometimes, on

account of the thick abdominal walls of the patient, or on account of the high degree of penetrability of the stone, a definite shadow is ob-

FIG. 46.



Photograph of calculi extracted from the left kidney shown in Fig. 34.
(ALBARRAN.)

FIG. 47.



Radiograph of uratic vesical calculus. (GOCH.)

tained only with difficulty. Under other conditions the radiographer has been very successful. (See Fig. 47.)

Regnier¹ says that the best results in radioscopy of the pelvis are obtained by putting the patient upon an inclined plane, so that the iliac and pubic bones will not mask the posterior regions. He advises the use of films rather than plates, because the former, by fitting the shape of the patient, may be pressed closer to the calculus than a rigid, fragile glass plate. The exposure should last twenty to thirty-five minutes, according to the strength of the current and the penetrating power of the light.

FIG. 48.



Radiograph of vesical calculus 3.1 cm. in diameter. (DAVIDSON.)

By adopting similar measures M. Davidson² succeeded in showing a vesical calculus very plainly after only ten minutes' exposure. (Fig. 48.)

The patient lay face downward on a film wrapped in a double layer of black satin cloth. The rays were passed obliquely, to avoid the large bones as much as possible. The position of the patient brought the calculus near the anterior abdominal wall. Aided by these measures the operator obtained a good picture of the stone.

What was said of the value of low-vacuum tubes in connection with radiography of renal calculi applies with equal force to attempts to show

¹ Radioscopie et Radiographie Cliniques, Paris, 1899.

² Archives of the Röntgen Ray, 1897, vol. ii., p. 15.

vesical calculi. Thus far no successful radiographs of biliary or intestinal calculi have been published; but in view of the rapid improvements which have been made in the use of the X-rays in the few years

FIG. 49.



Radiograph of calculus in right ureter.

which have passed since their discovery it would be stupid to assert that abdominal surgery has nothing more to expect in this direction. Indeed, it is quite within the bounds of reason to hope that by this means a diagnosis will be possible, not only of calculi of every character, but also of inflammatory lesions and tumors, and perhaps of intestinal obstruction.

OPERATIONS FOR REPAIR OF THE URETERS.

MacMonagle,¹ after a most thorough search through medical literature, arranges the various operations which have been devised to restore the continuity of a divided ureter under the following heads:

1. Invagination of the proximal into the distal end. This operation has been performed five times; four times with complete success. The fifth patient died, but the death could hardly be attributed to the ureteral operation.

2. Transverse end-to-end anastomosis. Seven cases have been reported, and three of the patients so operated upon died: one from

¹ American Journal of the Medical Sciences, 1899, vol. cxviii., p. 684.

tuberculosis seven weeks after operation, one in fourteen hours from peritonitis, and one in twenty days from hemorrhage. In each case the ureteral suture was satisfactory, being tight and leaving a sufficient lumen to the ureter.

3. End-to-side anastomosis. In this operation a longitudinal slit is made in the wall of the distal portion and the end of the proximal portion is drawn into it. Three operators have reported successes by this method.

4. Oblique end-to-end anastomosis. The advantages claimed for this method by its inventor, Bovée, are accurate approximation, the prevention of stenosis, and a smaller sacrifice of ureteral length than in some other operations. The operation has been carried out with success by its inventor.

5. Implantation into the bladder. This is the best-known method. It has been performed ten times without a death, the ureter being implanted intraperitoneally; and four times with one death from sepsis, the implantation being an extraperitoneal one.

6. Implantation into the bowel. This is a procedure which exposes the patient to grave risks, and should not be undertaken if one of the previously mentioned operations is possible.

7. Crossed anastomosis—*i. e.*, the implantation of one ureter into the other. Theoretically, this seems like a practical measure, but it has not been carried out, so far as known.

The choice of a method of repair will depend upon the location and extent of the injury to the ureter. Longitudinal wounds should be stitched and covered with peritoneum or omentum. Transverse wounds should be stitched. In experiments upon animals suture of the ureter usually fails; in man it usually succeeds. If a piece is nicked from the side of the ureter the suture should be made transversely, so as not to narrow the lumen. If the nick is large it is better to divide the ureter and perform either an invagination, or end-to-end or end-to-side anastomosis.

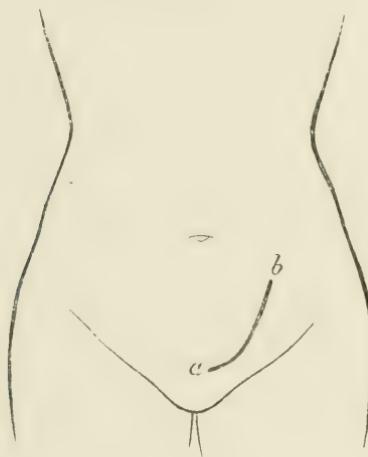
Nephrectomy has been often and successfully practised upon a patient one of whose ureters has been seriously wounded, but in view of the good results which follow plastic ureteral operations it is hardly justifiable except as a last resource. The ureter can be brought out through the skin, in order to gain time if necessary, and repair can be attempted at a later operation. Tying the ureter with a chance of atrophy of the kidney is poor surgery.

Injuries to the ureter may occur in many kinds of abdominal operations, but are most common as a result of vaginal hysterectomy. Such accidents can usually be avoided if the surgeon takes care to map out the ureters before operation, either with the fingers or by passing bougies

into them. Mass ligatures should be avoided, and vessels should be isolated and tied.

Sokoloff¹ is a strong advocate of the implantation of the ureter in the bladder as the best means of restoring the parts to their normal condition when a fistula of the ureter exists. Several points are in favor of this operation. It is possible to isolate the ureter for a considerable distance without affecting its vitality, for, as Margarucci has shown, the ureter is nourished by two arteries, branches of the arteries of the kidney, which accompany it nearly to the bladder. Moreover, when freed from the overlying peritoneum the ureter can without injury be stretched enough to make good considerable defects in its length. Podrez² stretched the upper portion of the divided ureter nearly 6 cm. (2.5 inches) and suc-

FIG. 50.



Line of incision for intraperitoneal uretero-cystoneostomy. (SOKOLOFF.)

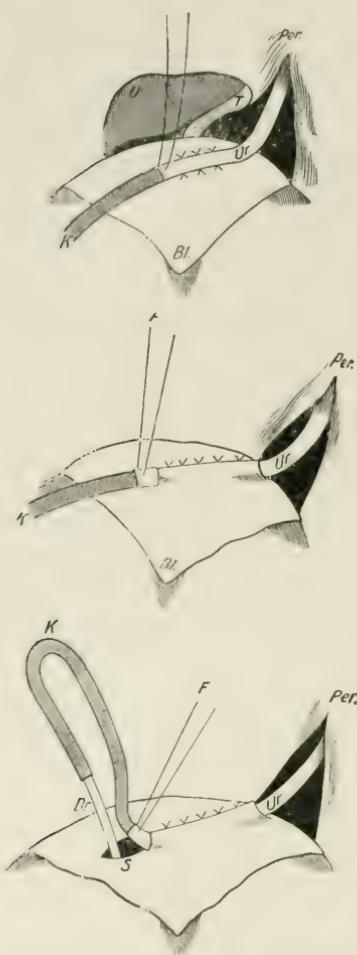
cessfully implanted it in the bladder. In order to stretch the ureter to such an extent the overlying peritoneum must be divided for a long distance. Consequently periureteritis, by lessening the elasticity of the tube, is a contraindication to this operation.

Sokoloff made experiments upon dead bodies to determine the relative advantages of extraperitoneal and intraperitoneal methods of anastomosis between the ureter and bladder. He favors the intraperitoneal method, by which it is easier to make a good implantation, to accomplish which it is necessary not merely to bring the end of the ureter into the bladder, but to fasten the ureter in the bladder wall for a considerable distance. If it is covered, by suturing over it the serous membrane,

¹ Deutsche Zeitschrift für Chirurgie, 1899, vol. lii., p. 185.

² Centralblatt für Chirurgie, 1899, p. 593.

FIG. 51.

Fixation of the ureter in the bladder.
(SOKOLOFF.)

Bl. Bladder. Ur. Ureter. Per. Peritoneum (divided). U. Uterus. K. Catheter lying in the ureter. Dr. Drainage-tube passed through the urethra and out through the wound in the bladder. S. Incision in the wall of the bladder. F. Fixation-suture for the catheter. T. Left Fallopian tube drawn to the right.

three months after her confinement, upward of thirty pounds. As the tumor was steadily increasing in size and the pain was becoming unen-

the attachment quickly becomes a very firm one, so that leakage of urine is most unlikely. The principle of Witzel's gastrostomy finds here a ready adaptation, and the operation performed by Sokoloff was carried out along these lines, as shown in the illustrations. (Figs. 50 and 51.)

Besides his own successful case, Sokoloff was able to collect twenty-seven others from the medical literature, in three of which operation had proved fatal, giving a mortality of 10.7 per cent. The oblique implantation which he employed, and which was first used for this purpose by Budinger,¹ proved so satisfactory that he wonders that it has not come into general use. Technically the operation is not a difficult one. If the distance to which the ureter has to be stretched is too great the bladder may be mobilized to a considerable extent. After the anastomosis is complete, ventrofixation of the bladder will aid recovery by keeping the bladder quiet while repair of the parts takes place.

SURGICAL TREATMENT OF ANEURISM OF THE ABDOMINAL AORTA.

Rarely has a surgeon reported a more satisfactory result after any operation than did Langton,² when in March, 1899, he published the cure of an aneurism of the abdominal aorta by the introduction of silver wire into the sac. The patient was a woman who had lost

in weight, during her pregnancy and

¹ Archiv für klinische Chirurgie, 1894, vol. xlviii., p. 639.

² Lancet, 1899, i., p. 901.

durable, an operation was decided upon. It requires boldness to thrust a trochar and canula into an abdominal aortic aneurism, but in this instance the bleeding which followed the withdrawal of the trochar was not alarming, and five feet of silver wire were passed into the sac through the canula without difficulty. The canula was then withdrawn and the opening was closed by a silk ligature. Recovery was prompt, but a month later manipulation of the tumor brought on a collapse, which for a time seemed serious. The symptoms were of short duration, however, and the patient entirely recovered. A year later the tumor had shrunk to a small, firm mass, which caused practically no trouble.

Finney¹ reported a case in which five feet of silver-alloy wire were passed into an abdominal aneurism and connected with an electric battery. A current of 30 to 70 milliampères was passed for an hour, and the sac became at once firmer and smaller. The patient died on the twentieth day after operation.

Finney made numerous experiments to determine what kind of wire is best suited for this purpose, and also noted the effects of electric currents in producing coagulation of the blood. He found that an alloy containing 75 parts of copper and 1000 parts of silver gives a very springy wire, which will not kink in introduction and will not stick into the walls of the sac, but will coil up loosely in its cavity. He introduces the wire through an aspirating needle, the penetrating portion of which is lacquered for insulation. The wire should be connected with the positive pole of the battery, and the current should not be too strong nor too long continued. The three conditions requisite for success in the surgical treatment of any aneurism are :

1. The aneurism must spring from the front of the vessel.
2. The sac must be perfect.
3. There must be a coagulating property in the blood.

In the case of abdominal aneurism the difficulties in the way of treatment are numerous, and practically only those aneurisms are suitable which reach the surface.

Finney tried in nine cases injections of gelatin to increase the coagulability of the blood. The injections were painful and were sometimes followed by fever, not due to infection; but in no instance, as far as could be ascertained, was there any increased coagulation of the blood. No patient was cured, but the condition of one improved after the injections.

This plan of treatment is of French origin and of comparatively recent date. Lancereaux² tried it first upon a man in 1897, and claimed to have cured his patient of all symptoms of a large aortic aneurism by

¹ Medical News, 1899, vol. Ixxvi., p. 155.

² Gazette des Hôpitaux, 1897, p. 713.

twelve subcutaneous injections of a 1 per cent. solution of gelatin in a normal salt solution. Each injection measured 50 c.cm. (1.6 ounces). The matter came up for discussion at a meeting of the Union for Internal Medicine of Berlin,¹ May 1, 1899, when Fraenkel reported a success by this method. Others spoke disparagingly of it. Certainly the treatment has thus far found little favor except in the eyes of a very few surgeons, and all agree that the injections are very painful.

¹ Deutsche medicinische Wochenschrift, Vereins-Beiträge, 1899, p. 157.

GYNECOLOGY.

BY JOHN G. CLARK, M.D.

THE USE AND ABUSE OF NORMAL SALT SOLUTION.

THE more extensive one's experience becomes in the use of normal salt solution as a stimulant in abdominal operations, the more convincing is the evidence in favor of the great benefits to be derived from it. For the last four years I have made it a practice to leave at least one litre in the peritoneal cavity after even the simplest operations. There can no longer be the slightest question as to its advantages, and, if the salt solution is sterile, there can be no danger from its use.

J. Wesley Bovée,¹ under the above title, gives a very practical summary of the benefits and of the abuses of the use of normal salt solution. The methods of administration are intravenous, subeutaneous, intraperitoneal, by rectal enema, and through intra-arterial infusion.

As to the physiological action of normal salt solution, it is found that it increases the volume of the blood, lessens its specific gravity, stimulates the cardiac ganglia, and accelerates circulation. Through the increase in the volume of blood the arterial tension is raised and a larger blood-supply is carried to the vital organs. The stimulation of the nerve centres is sometimes very marked, causing considerable excitement. The functions of the skin, kidneys, and intestines are greatly stimulated, and, in fact, all of the organs of the body functionate better under its influence. It does not coagulate blood, but, on the contrary, dilutes and keeps it in a fluid state. It has a distinct stimulating effect on osmosis, and thus may influence excretion of urine and other secretions of the body.

According to Fourmeaux and others the number of red corpuscles is distinctly increased through the employment of normal salt solution. The quantity of urine is very greatly increased, being frequently four times the usual amount, and associated with this is a great increase in the quantity of urea. The sodium chloride is so greatly increased in its amount that Fourmeaux has noticed a salty taste and crystals of salt upon the lips of puerperal septic women some time after the administration of saline solution.

¹ American Journal of Obstetrics, 1899, p. 16.

In autopsies made shortly after large quantities of normal salt solution have been employed hypodermatically, considerable quantities of thin fluid rich in sodium chloride have been found in the intestines.

Its therapeutic use is very extensive, and in many medical and in a very large number of surgical cases it can be employed with the greatest benefit. According to Bovée, its special use in abdominal cases is to prevent shock, to lessen the effects of hemorrhage, and to decrease the virulence of infections.

When employed in shock which results from loss of blood or traumatism of an extensive operation it should be administered at the earliest possible moment. If a patient shows evidence of depression during the operation, liberal quantities of the solution should be given subcutaneously, and one or two litres of solution injected into the bowel when the patient is in the Trendelenburg posture is of the greatest service.

According to Bovée, severe hemorrhage is the only indication for intravenous infusion. In his abdominal surgery he invariably leaves a considerable quantity (one to fifteen litres) of normal salt solution in the abdominal cavity. These saline infusions into the peritoneal cavity are of great service in floating the intestines out, in dissolving exudates and blood clots and in neutralizing the effects of infectious matter, and thus assist in their more prompt absorption.

The quantity to be injected in cases where there has been more or less hemorrhage depends upon the extent of the depletion. If given into the vein it should be about equal in amount to that of the blood lost, and if subcutaneously twice the quantity may be given. Rectal enemata may practically be unlimited, although two litres are usually sufficient.

As contraindications to the use of salt solution Bovée mentions atheroma, arterio-sclerosis, cardiac degeneration, bad valvular lesions, thrombosis, and recent cerebral apoplexy. Other conditions which are liable to be aggravated by it are chronic inflammatory conditions of the kidneys and chronic affections of the liver and of the lungs.

He advises against the use of salt solution infusions during any form of active hemorrhage, claiming that the vessels would thus be distended and more blood would be forced out of the wounded vessel.

In the presence of toxins in the system the elimination of normal salt solution is said to be retarded, and, therefore, only small quantities should be given at a time and repeated as often as required.

Among the precautions which he advises as essential to the successful injection of salt solution are the following: absolutely sterile salt solution, thorough sterilization of canula and tubes through which the solution is given, careful cleansing of the skin into which the needle is to be plunged, the avoidance of the passage of air into the tissues or vessels.

In order to get the best stimulating effect from the salt solution it should range in temperature from 105° to 120° F. When there is a long rubber tube leading from the reservoir to the canula the solution may be considerably cooled in transit; in order to avoid this Bovée advises its immersion in a bowl of warm water.

Noble and others have warned against the overdistention of the subcutaneous tissues with too much salt solution, as in this way a local necrosis may be induced. When intravenous injection is employed the inflow of the solution should be gradual, for when a considerable quantity is rapidly thrown into the vessels pneumonia, engorgement of the liver and spleen, effusions into the pleura, peritoneal cavity, and subarachnoid spaces are said to occur.

Among the alarming symptoms which have been noted are dyspnoea, headache, vertigo, specks floating before the eyes, somnolence, mental excitement, delirium, hallucinations, severe pain in the left side and throbbing in the neck. According to Bovée, the tension of the arteries is the criterion as to the amount of solution to be employed, though this does not always hold good in sepsis; in shock and hemorrhage the radial pulse is usually a good guide.

Among the practical advances in surgery which have been made in the last five years, next to the Trendelenburg posture I look upon the various uses of salt solution as being of the greatest value. For at least five years I have been convinced of the great benefits to be derived from the use of saline infusions into the peritoneal cavity, beneath the mammary glands and into the rectum. My attention was first called especially to its value in preventing thirst. As a result of a very careful study of a series of one hundred cases in which I employed the rectal infusions with the patient in the Trendelenburg posture, I noted primarily an almost complete elimination of the excessive thirst from which patients suffer after the administration of ether. In the line of my investigation I found also that this was not the least benefit derived, but that the action of the salt solution upon the kidneys was most beneficial in that the urinary excretion was increased twofold, and thus the patients were very greatly relieved of vesical irritability from which they had in former times suffered. In this way the necessity for catheterization was greatly lessened, and proportionately less was the occurrence of cystitis.

In another research upon the subject of drainage I came to the conclusion that the absorption from the peritoneal cavity was so rapid that we could not hope to eliminate infectious matter from the peritoneal cavity by means of the glass or gauze drain, and therefore strongly recommended the abandonment of artificial methods of drainage except in rare cases, and the employment of the lymphatic channels as the routes by

which the infectious and foreign materials were to be removed. To assist the lymphatic system I advised the infusion of large quantities of salt solution into the peritoneal cavity, followed by the elevated dorsal posture, in order to hasten the absorption before it was possible for the infectious organisms to multiply. As a result of the peritoneal infusions, time and time again I have seen almost moribund patients recover in a remarkable manner, the extra stimulation which was given by the salt solution being apparently the agent which carried them over the critical period.

With a large series of cases, therefore, before me, in which the practical value of saline infusions has been so well demonstrated, I now look upon this remedy as being a very important one in our therapeutic armamentarium.

Bovée warns against the employment of saline solution in chronic kidney diseases. My experience has been exactly to the contrary, for in numerous instances where patients have had more or less renal involvement, as indicated by the appearance of albumin and casts, I have seen instead of untoward results the most marked improvement in the urinary excretion for some days after the operation. Renal disease, therefore, I should not look upon as being a contraindication to the administration of salt solution. The other untoward results which have been noticed so far as my own experience is concerned are very rare indeed. In fact, I have not yet seen a single instance in which saline infusions subeutaneously, into the peritoneal cavity, or into the rectum have given the least symptom to cause me to think that the salt solution has produced any ill effects. I cannot say, however, so much for the intravenous and intra-arterial infusions. The arterial infusions may be viewed askance, for in some instances extensive necroses have occurred at the point where the solution has been injected into the radial artery. This complication is not so likely to occur in the intravenous injections. From practical experience I have been convinced that submammary infusions are quite as beneficial and act almost as rapidly as the intravenous infusions, and are infinitely easier to give and are unattended with any disadvantages if properly administered. In a series of several hundred cases in the Johns Hopkins Hospital a mammary abscess occurred in but one instance, and this was in a woman who was suffering from profound streptococcal infection.

My own plan is to leave at least one to two quarts of salt solution in the abdominal cavity after every abdominal operation, and in addition to this a quart may be given beneath the mammary glands in case the patient shows immediate shock. As a routine measure in all operations, either minor or major, one to two litres of salt solution are given per rectum for the purpose of alleviating thirst. As a result of the rectal

enemata the intense thirst from which these patients formerly complained is alleviated. It is not an uncommon experience for these patients to go sometimes twenty-four hours without even asking for water. The submammary infusion of salt solution is such a simple operation that I feel that every physician should have a special infusion apparatus which should be included in his obstetrical and surgical armamentarium.

In all profound infections, either medical or surgical, liberal quantities of salt solution should be employed, and in puerperal cases where there is hemorrhage or infection this is undoubtedly a sovereign remedy.

TUMORS OF THE ABDOMINAL WALL.

Tumors of the abdominal parietes, with the possible exception of lipomata, are comparatively rare. A consideration of this subject, therefore, from such an eminent authority as Olshausen, of Berlin,¹ is of considerable interest.

Fibromata. Among the most frequent of the tumors of the abdominal wall, Olshausen classifies the fibromata, having seen twenty-two cases in twelve years. Of these twenty-two cases, the majority occurred in middle age, eighteen ranging between twenty-five and thirty-five years. In opposition to this observation of Olshausen, Ledderhose claims that women between the ages of twenty and twenty-five years are more disposed to tumors of this class. Like all tumors, however, they may occur in the young or in the aged.

One fact of some interest to which Olshausen calls special attention is that all of the twenty-two women had borne children. According to his belief, which is in accord with that of preceding writers, there is some relationship between the origin of fibromata in the abdominal wall and pregnancy. In sixteen of Bilioth's cases, between the ages of twenty-one and forty years, all had borne children. A still more suggestive evidence in favor of this hypothesis is that in not a few cases the tumor first came into evidence during pregnancy. This was true in five of the twenty-two cases of Olshausen.

These tumors may occur first during pregnancy, or, if present at that time, they may show the same tendency as myomata of the uterus to grow rapidly during this period.

There are two sets of theorists, one of whom, led by Herzog, claims that these tumors originate in the muscle, whereas the other, represented by Sänger, claim that they arise from the fibrous sheath of the muscle. Sänger also concludes that there is an unquestioned etiological relationship between pregnancy and the origin of these tumors, but does not

¹ Zeitschrift für Geburtshilfe und Gynäkologie, 1899, vol. xli.

attempt any further explanation of this theory. Olshausen believes that the cases of Ebner, Baker-Brown, Bennett, Bodin, and A. W. Freund demonstrate an undoubted relationship between the traumatism of pregnancy and the origin of these tumors. As early as 1857, Virchow pointed out the fact that rupture of the recti muscles occurs on the posterior surface, which corresponds to the situation of these tumors. This observation of Virehow, therefore, serves as a further support for the theory of the traumatic origin of these tumors.

In Olshausen's series of cases eleven occurred in the sheath of the recti muscles above the umbilicus. Of this number nine were found on the posterior leaf, while only two were situated upon the anterior leaf of the sheath. In two other cases the fibromata were situated upon the sheath of the external oblique muscle, and in five upon the sheath of the internal oblique.

Another interesting point which Olshausen points out, and which according to my opinion should be taken into consideration in the diagnosis of these tumors, is that a number of them were in intimate association with the bony or skeletal systems. In three cases they were connected by a pedicle with the cartilages of the false ribs, in one case with the anterior superior spine of the pubis, and in one case with the ilium, which required their division with the knife in order to effect their removal.

This bony connection of fibroma was first described by Nelaton in 1862, and Guyon endeavored to prove that this was secondary to the original growth. The close connection of these tumors with the bony structures, however, leads Olshausen to believe that the evidence perhaps is in favor of this being the primary rather than the secondary site of growth.

The size of the tumors as observed by Olshausen varied between that of a hen's egg and the fist. The largest tumor reported by him reached a larger size (16 x 16 inches). Much larger tumors than this have been reported by other observers. The growth of these tumors is occasionally very rapid, as, for instance, in the case observed by Gussenbauer, which increased from the size of a hen's egg to that of a child's head in two years, and also in the case of Gusserow, which increased in one and a half years from the size of a hazelnut to that of a mass weighing eight and a half pounds. These rapidly growing tumors are rich in cells, and are usually of the myxofibromatous type.

The form of the tumor naturally depends upon its environments; in some cases it is a flattened ovoid, and in others a bullet- or bean-shape. One would naturally expect the tumor in its growth, especially those which rise on the posterior leaf of the rectus muscle, to project toward the peritoneal cavity, but it has exactly the opposite tendency. The

majority spring toward the outside and are characterized by tense stretching of the skin. There is a marked contrast between the size of the tumor and this excessive prominence or stretching of the skin, which Olshausen believes to be almost pathognomonic of these tumors. Indeed, he considers it so characteristic as to lead to the correct diagnosis on the first inspection of the tumor.

The majority of these tumors are pure fibromata; occasionally there may be a rich mixture of spindle cells or even a considerable infiltration of round cells; the latter occurrence, however, is not to be taken as a malignant degeneration, as, for instance, in Ledderhose's 100 cases, in which 72 were counted as fibromata and 18 as sarcomata. According to Olshausen, there is a suspicion that of the latter number a certain proportion were really benign tumors. In this connection it is noted that the fibromata of the abdominal wall are similar to ovarian fibroids, which often show a simple round-celled infiltration which strongly simulates sarcoma. In the differential diagnosis of these two conditions, however, the greatest care should be observed, because a malignant may be mistaken for a benign tumor.

In this connection it is interesting to state that in some cases there is a tendency for the occurrence, one after the other, of fibroids of the abdominal wall. As an evidence that these tumors are not malignant is the fact that they appear in some area more or less remote from the point of first removal and do not tend to recur at their original site.

The **DIAGNOSIS** in the majority of cases is easy—the prominence of the tumor, its superficial position immediately beneath the skin, the lateral mobility, the more or less fixation in a perpendicular direction, and the ill-defined borders, are characteristics of these tumors.

Although the diagnosis may be comparatively easy while the tumor is small, as it reaches larger proportions all of these differential signs may disappear, and it is frequently difficult not only to diagnosticate the character, but also the site of the tumor. Thus in three of the largest cases reported (Weir, Weinlechner, and Rokitansky) the tumors were thought to be of intra-abdominal origin. In the cases of Esmarch and Singer, of equally large tumors, a correct diagnosis was made before operation.

Olshausen says that in a few cases he has been led astray in his diagnosis—in one case he mistook a fibroma of the sheath of the rectus for a pedunculated fibroid of the uterus; in another case a myoma of the anterior wall of the stomach for a fibroid of the abdominal wall, and in a third case a carcinomatous tumor of the gall-bladder for a fibroid tumor.

Naturally, the **TREATMENT** in these cases is total extirpation of the tumor. While it is, perhaps, better not to open the peritoneal cavity, nevertheless this, as we know, is not especially to be avoided. A char-

acteristic of this tumor noted by Olshausen is that in its growth from its connective tissue base the fibres of the muscle of the rectus are not involved, but are simply pushed aside, so that it is possible by means of careful suturing after extirpation of the tumor to completely restore the integrity of the rectus muscles.

These cases of fibroid tumors of the abdominal wall reported by Olshausen are of considerable interest to the abdominal and gynecological surgeon, because the question of MALIGNANCY will naturally arise. It is interesting to note that in all of the twenty-two cases reported by Olshausen there was no instance of malignant involvement. The occurrence of the round-celled infiltration is of especial interest, both from a practical and from a pathological stand-point, for it renders a differentiation of malignancy and benignity in some cases very difficult. In the simple round-celled infiltration, due perhaps to inflammatory reaction, the prognosis is the same as in a simple fibroid; on the other hand, even the slightest tendency to the formation of the round-celled sarcoma is naturally a complication to be very much feared.

There is a class of tumors appearing subsequent to operation which are pure implantation growths, and, of course, are of a malignant character. Olshausen, as well as numerous other writers, has noted this class of cases. In one case which I recall, a tumor of the uterus which was removed by hysterectomy and was thought at the time of operation to be a simple fibroid, but which was proved by a later microscopical examination to be a sarcoma, was followed some six months or a year afterward by a similar involvement of the abdominal wall at the site of the incision. In this case there was no question as to the origin of the tumor, for it was undoubtedly a simple transplantation growth. These tumors, however, need not, as a rule, give rise to difficulty in diagnosis, for contrary to the rule in fibroid tumors of the abdominal wall, they recur at the site of the incision rather than more or less remote from it.

CARCINOMA OF THE FEMALE URETHRA.

Notwithstanding the comparative frequency of carcinoma of the cervix, vagina, and external genital organs, the female urethra is a very infrequent seat for primary involvement, although one continually sees, in cases of carcinoma of the generative organs, a secondary involvement of the base of the bladder and the urethra. The fact that only about two dozen cases of carcinoma of the urethra have been recorded proves that they are of extremely infrequent occurrence.

Ehrendorfer¹ has made a thorough review of the literature of this

¹ Archiv für Gynäkologie, 1899, vol. Iviii.

subject, and has added some interesting cases. So far as the pathology, symptomatology, and treatment are concerned there is practically nothing added to the subject, and, after all, the same general principles as to pathology and treatment which obtain in other organs are essentially the same here. To one continually seeing cases of carcinoma the fact becomes more and more obvious that while we may have made marked progress along the line of pathology, as yet we know little or nothing of the etiology, and our best methods of treatment are, to say the least, decidedly unsatisfactory.

The futility of all forms of treatment when the carcinomatous process has extended outside of its primary limited area is constantly forced upon us, for, notwithstanding the most radical operations or the most thorough local treatment, the extension of the pathological process is frequently not impeded, but apparently hastened. The wide-spread interest in the study of carcinoma is a strong evidence that sooner or later something more definite as to the etiology will be discovered. Certainly a careful investigation and recording of groups of cases, such as these of Ehrendorfer, will lead to good statistical results.

As a conclusion to his extensive paper upon this subject, Ehrendorfer summarizes the chief points as follows:

1. Carcinoma of the female urethra, according to the published reports, is infrequent.

2. On account of the uncertainty of the classification of these cases, which have previously been divided into primary urethral and periurethral carcinoma, all carcinomata which have originated in the course of the urethra, exclusive of the external opening, should be classified as primary urethral cancers. If they originate from the outside they should be divided into urethral and vulvo-urethral carcinomata.

3. The first class are true mucous membrane carcinomata, and are of the glandular type; the second are in general of the epithelial type. The epithelial are more frequent than the glandular carcinomata.

4. The vulvo-urethral carcinoma originates in the region of the external meatus and rapidly extends to the mucous membrane of the urethra. So far as physical appearances are concerned, these carcinomata do not spread out over such a wide surface as those which originate in other parts of the vulva and extend secondarily to the urethra.

5. In the advanced cases, differentiation of the type of carcinoma is impossible.

6. Concerning the relationship of the lymph-glands and the different forms of carcinoma, nothing definite is known. Whether the swollen glands frequently seen in these cases are the site of metastasis or not can only be determined microscopically.

In his bibliography, Ehrendorfer appears to have gone into this subject very carefully and to have collected the chief papers written upon this subject (thirty in all).

HERMAPHRODISM.

For many decades and even centuries cases have constantly been reported in medical literature of so-called true hermaphrodism. Concerning this question there seems to have been considerable doubt, and of the large number of cases which have been reported there are only a few in which there is any doubt as to the true sex of these atypical individuals.

According to the scientific definition of this embryological anomaly, there must be combined in one individual all of the attributes of the male and female sex; thus, the presence of the external organs of one or the other sex with the internal organs of the opposite does not constitute a true but a false hermaphrodite.

In order to obtain a proper conception of the aberrant forces which bring about this uncanny condition of affairs we must revert to the embryology of the sexual organs. In the young embryo the principal organs of the abdominal cavity are the two Wolffian bodies. Upon the dorsal aspect of these organs are situated the Müllerian and Wolffian ducts, which run together from the head end of the Wolffian body into the pelvis, where they terminate in the cloaca. At the head end of these ducts either an ovary or testicle arises through the proliferation of the germinal epithelium on the surface of the Wolffian body, which undergoes organization into the male or female gland through the projection of the connective tissue and bloodvessels from the stroma of the Wolffian body.

In the true hermaphrodite, either an ovary and testicle should arise on both sides or there should be an ovary on one side and a testicle on the other. In this way the characteristics of the two sexes might possibly be combined in one individual. As the facts now stand, it appears that the external and in part the internal sexual organs may be duplicated, the male and the female type partially existing in one individual, but no absolutely unchallenged case of the coexistence of the male and female gland in one individual has so far been described.

In 1896 Blaeker reported before the Obstetrical Society of London a case which he took to be of true unilateral hermaphrodism, with the presence of an ovary on one side and a testicle on the other.

Since the report of Blaeker's case it has evidently been challenged, for he has submitted the case to Nagel,¹ of Berlin, who is well known

¹ Archiv für Gynäkologie, 1899, vol. Iviii.

for his splendid researches in the embryological development and anatomical anomalies in the female sexual organs due to a deviation from the normal types.

Blacker's case was that of an eight-and-a-half-months' dead-born fetus which showed no abnormalities of the body outside of the sexual organs. The external genital organs presented the appearances of both the male and the female types. The internal organs consisted of a shortened vagina and a defectively developed uterus unicornus, with a relatively large cervix. The right Fallopian tube and the broad and round ligaments were of normal appearance, and the sexual gland presented the appearance of an ovary. On the left side there was a rudimentary tube and epididymis and a vas deferens; the latter was patent and could be traced to the vagina, but its termination could not with certainty be ascertained. On microscopical examination the sexual gland on the right side, which was thought to be an ovary, was found to consist of connective tissue stroma, forming compartments which were filled with cell masses; under the surface the stroma was thickened and constituted a tunica albuginea which completely enveloped the gland. In the centre of the gland the stroma predominated, in the periphery the epithelial elements. The latter formed, toward the middle of the gland, small, slightly twisted cell columns, which consisted of two varieties—small, round, or polygonal, and large, well-staining cells, rich in protoplasm and possessing large nuclei. The smaller cells predominated, and in some places showed a tendency to the formation of spaces similar to primary Graafian follicles.

The left sexual gland, while somewhat atrophied, showed unmistakable histological elements of the testicle. On the ground of this investigation Blacker assumed that the right sexual gland was an ovary and the left a testicle. Blacker is also of the opinion that his case is the first one which is free from doubt as to being a case of true hermaphrodisim. His specimens have been submitted to Nagel, who, after a careful examination, states that he is not able to sustain Blacker's assumption. After a very thorough review of Blacker's microscopical sections Nagel comes to the conclusion that this case is not one of double sex, but that both sexual glands are testicles.

The fact that on the right side an unmistakable Fallopian tube is present is not a convincing evidence of the female sex, for frequently in male hermaphrodites the Fallopian tubes are present.

After classifying Blacker's case in the male category, Nagel makes the statement that up to the present time there has been no case of true hermaphrodisim (ovary and testicle in the same individual) reported.

In the living individual, especially the adult, it is very difficult in some instances to differentiate sex. This is certainly impossible from

the strictly anatomical stand-point, for in some of these cases the external organs of both sexes have been more or less well represented. In all of the recent cases which have been reported¹ the male characteristics have predominated.

It appears, therefore, that there is a greater tendency to the formation of the male than the female sex in these questionable individuals. In the female type, when the patulous vagina and the uterus are present, the diagnosis is not difficult.

THE ULTIMATE RESULTS AFTER PARTIAL OR COMPLETE REMOVAL OF THE OVARIES AND FALLOPIAN TUBES.

As I stated in my review last year,² I feel that there is no more important line of research now open to the investigator than the careful determination of the ultimate results of operations, and especially those for the removal of the ovaries and tubes.

In the early progress of abdominal surgery, after the aseptic era was inaugurated, the mortality even after major abdominal operations became so slight as to encourage the surgeon to perform even hazardous operations for the relief of comparatively simple subjective symptoms. Thus, for instance, in many cases the Battey operation was performed in order to abrogate, by the removal of the ovaries, the menstrual function in cases of dysmenorrhœa.

With the observation of these cases subsequent to operation it was soon found that the untoward symptoms which came as a sequel to the operation were frequently more distressing than the original symptom. Very soon, therefore, radical changes were observed in the bearing of gynecologists in general toward operations devised for the simple relief of symptoms and not to save life.

For the last five years there has been an increasing tendency toward conservatism, as a result of which cases have been studied with a view to limiting as far as possible radical operations. Thus, for instance, in cases of pyosalpinx it has been found feasible to remove only the tube, leaving the ovary of the infected side behind, and thus menstruation has not been abrogated.

In my review for the year 1899, I detailed the studies of Pfister, who followed as far as possible the ultimate results in 179 cases of ovariotomy. Since the publication of that article a number of papers have been written upon the same subject, among which that of Cohn, of Berlin, is worthy of review. Unfortunately, however, of 87 patients he

¹ Hansemann, *Berliner klin. Wochenschrift*, 1898; E. Alexander, *Deutsche med. Wochenschrift*, 1897; Christopher Martin, 1895; Böckel, 1892, and other cases.

² *PROGRESSIVE MEDICINE*, June, 1899, Vol. II.

was able to receive definite information from only 32, which leaves a very large number unaccounted for.

It is assumed by some surgeons that those cases which do not report subsequent to operation, but which are still undoubtedly living, may be considered cured ; this, however, I look upon as an error, for every surgeon who has had an extensive experience with hospital cases knows that patients constantly come for treatment who have been for a long time under the care of some other surgeon without relief, and finally becoming discouraged, have ceased visiting the first surgeon to consult a second. To assume, therefore, that such patients are well because we have not heard from them may lead to very serious statistical errors.

Of the 32 patients concerning whom Cohn was able to speak definitely, the ages ranged between nineteen and forty-eight years. More than half of them (17) were between thirty and forty years, 6 between twenty and thirty years, and 8 between forty and fifty years. Of these 32 women, 11 were childless and 3 were single ; the remainder had borne children at full term and had had miscarriages. From the histories of these patients it was found that the majority had suffered from inflammatory affections ; in four cases there was tubal pregnancy ; in one case carcinoma of the cervix and in another myoma of the uterus.

Concerning these cases, he says that all of them had been treated by conservative measures for months, and in some instances for years, before they finally underwent an operation. In all cases the dangers of the operations were explained to the patients, but they invariably preferred to risk the dangers of an operation rather than to remain persistent sufferers without the ability to carry on their daily work.

Under the various headings of results he takes up, first, the ability to work subsequent to operation. Of 32 cases, 26 were completely restored to health and were able to do heavy lifting, etc., without any discomfort ; 2 remained totally incapable of work, and 4 were only partially restored to health. Of the four who were only partially restored, all claimed to be so much better than before operation that they had no regrets for having undergone it.

Considered from the stand-point of ability to carry out their daily vocations, it would appear, therefore, that the results were absolutely satisfactory in 26 cases, partially so in 4, and negative in 2. Could we feel definitely assured that all of the 87 patients who were operated upon, but were not heard from, could show equally satisfactory results, it would be most comforting.

Concerning the cessation of menstruation, Cohn found in all instances where one tube and ovary remained that menstruation continued without interruption. In every case where the uterus and adnexæ were totally removed there was no further appearance of the flow.

In those cases in which the uterus was left there was considerable variation. In 10 of the 21 cases menstruation ceased absolutely after the operation, while in 11 cases the flow continued. In 6 of these the flow continued regularly, and in 5 more or less irregularly. Of the six in which menstruation recurred regularly the first flow was noticed in from two to six months after the operation. As a rule, menstruation continued more or less regularly for a year, then became irregular, and finally ceased.

These results correspond in general with those which have been reported by other writers. Thus, Chrobak has found in 38 per cent. and Glaeveke in 14 per cent. of cases that the menses recurred after double oophorectomy. According to these writers, not only small particles of ovarian tissue which remain behind, but also scar tissue in the stump, may give rise to sufficient irritation to continue the menstrual function.

In nearly all articles which have been written on the sequelæ of abdominal operation we find that the writers detail more or less distressing symptoms after the total removal of the ovaries. To obviate these Cohn strongly advises leaving at least a part of the ovarian tissue.

These symptoms may be divided into two classes, the first group being classified under the head of the menstrual molimina and the second under climacteric molimina. The first is characterized by pain in the lower abdomen and sacrum, nausea, dragging sensation, feeling of fulness, headache, tendency to syncope, etc. The climacteric symptoms are feelings of heat, sweating, flushing, and dizziness. There is a considerable difference in these symptoms in that some patients do not experience them at all, or at most, very slightly, while others are greatly troubled by them. Those which may be classified as menstrual molimina are much more prominent at the time when the regular menstruation should appear, whereas climacteric symptoms are more or less daily in their occurrence, and when very severe are noted every ten to fifteen minutes.

Fortunately, the last few years have brought forth a remedy which appears to be of great service in these cases. The administration of ovarian extract in the form of tablets, while not completely removing these symptoms, at least greatly ameliorates them, and, if the remedy is taken constantly, the patient may be kept comparatively comfortable until the menopause is well established. It has frequently been noted that so long as the remedy is taken the patient is comparatively comfortable, but the moment it is stopped the old symptoms return in all their intensity. The rule, therefore, in the administration of ovarian extract should be to continue it uninterruptedly until the menopause is established.

Cohn has noted the same results as others concerning the tendency for these patients to become stouter. In conclusion, he takes the stand which I personally am radically in favor of, that the abdominal operation is the preferable one, because we may thus preserve even small portions of the ovarian tissue and the uterus itself. According to my opinion, the uterus is not a useless organ after the appendages have been removed, as held by many; for, as we have frequently seen, when small bits of the ovarian tissue have been left behind with the uterus, menstruation is prolonged until the normal menopause occurs. In this way all the discomforts incident to the onset of the premature cessation of the menses are avoided, and the operation in relieving the symptoms for which it was performed may be looked upon as a great success.

EXPERIMENTAL INVESTIGATION OF ATROPHY OF THE UTERUS FOLLOWING CASTRATION.

From a clinical stand-point it has been known for a number of years that immediately after the removal of the ovaries the uterus undergoes atrophy. Concerning the specific structures which are involved in this atrophy, however, there have been no definite results recorded.

Hegar, in 1878, and Kehrer, in 1887, experimented upon young pigs and rabbits, and found that the uterus after castration either underwent atrophy or remained in an undeveloped state.

Weissmann and Reissmann have also studied the alterations in the uterus, but the longest period between operation and death of the animal was only four months. According to their observations, the cylindrical cells of the mucosa became cubical and finally underwent fatty degeneration; the glands of the uterus entirely disappeared, and the mucosa became greatly atrophied.

In an experimental investigation conducted by Krukenberg he endeavored to discover what became of the cilia of the cylindrical epithelium of the uterus. According to the statements of Bischoff, Beeke, and Wyder, it has been demonstrated that the ciliated cells of the uterus only appear just before puberty and disappear after the menopause.

According to Krukenberg's investigation, he found that in experimental castrations the ciliated cells of the uterus disappeared in nine to ten months after the operation.

Sokoloff is among the latest investigators along this line, having conducted experiments upon a series of animals, in one set of which he extirpated only one ovary, and in the other both. In those animals which had lost only one organ there was no change whatever in the size or histological characteristics of the uterus, whereas in the others there were marked atrophic changes. Animals from which both ovaries were

removed soon became apathetic and heavy in their movements, and there was a marked tendency to the accumulation of fat. Contrary to the result of preceding investigators, Sokoloff found that atrophy was especially noted in the muscular structure of the uterus, and that even fourteen months after castration the ciliated cells were still present.

These experimental investigations on animals have been further supplemented by observations in human individuals upon whom ovariotomy has been performed and who have subsequently had the uterus removed for other diseases. As detailed by Glaevecke, the following changes were noted: In the cervix there was a gradual atrophy and decrease in size. Any tendency to ectropion of the mucous membrane before the operation disappeared rapidly after the castration; erosions and ulcers likewise healed rapidly, and the cervical mucosa underwent rapid atrophy. In the fundus atrophy began immediately after the castration, the uterus becoming harder, more resistant, and poor in its blood-supply. In this way the os internum was very greatly narrowed or even entirely closed.

Leopold has noted in this atrophic process that there is a typical endarteritis obliterans, especially in the large vessels of the uterus. In general, the observations of other investigators concerning the experimentally induced atrophy and the atrophy incident to normal senile changes correspond.

Jentzer and Beuttner have quite recently gone over the entire ground in a very careful experimental study on cows, rabbits, and pigs, and their practical conclusions coincide with those which have been observed in the past. It may be considered, therefore, that absolute conclusions can now be drawn as to the atrophic process which occurs subsequent to castration. Relative to the tissues involved, it is found that the muscular structure is rapidly decreased in volume, the bloodvessels become atrophic and sclerotic, and the mucosa is very much decreased in thickness, due to the disappearance of the cylindrical ciliated epithelium. In this way the uterus is decreased in size from its normal to a very small functionless body.

THE TREATMENT OF PELVIC PERITONITIS.

In an extensive article,¹ C. H. Stratz considers the conservative treatment of the inflammations of the pelvic organs. He does not definitely localize the inflammatory conditions under such names as perioöphoritis, perisalpingitis, salpingitis, etc., but says that the treatment which he has instituted has been for the relief of the inflammatory condition in gen-

¹ Zeitschrift für Geburtshilfe und Gynäkologie.

eral. He states that of over 800 cases of diseases of the adnexæ only twenty have been submitted to operation.

If Stratz's statistics have been carefully compiled the method of treatment which he has employed in pelvic inflammations has certainly given good results. During the operative era of the past decade we have possibly come to look upon the removal of inflammatory affections, especially when there are purulent accumulations, as absolutely necessary for the saving of life. Certainly a more rapid convalescence may be secured in this way, but the question has arisen in the minds of many gynecologists as to whether good results may not also be obtained by more conservative methods. As we have learned through long observation, pyosalpinx comparatively rarely causes a general peritonitis through rupture. So slight is the danger in this direction that we frequently permit patients to go several days before resorting to operation, in the hope that there may be some amelioration of the acute infectious symptoms before operation is undertaken.

Freund, who has been very active as an operator, and, therefore, cannot be looked upon as a man who is unduly timid, speaks favorably of the possibilities of conservative treatment of even such a condition as pyosalpinx.

The employment of hot water to allay pelvic inflammations is not new, for such eminent authorities as Troussseau, Kiwisch, and Emmet have recommended it in the past. Bertram, however, was perhaps the first to take up the subject in an extensive manner. Through vaginal douches of hot water (38° to 40° C.) he claims to have secured most satisfactory results in the treatment of metritis, endometritis, colpitis, and pelvioperitonitis. The duration of the treatment is from four to twelve weeks. Of 126 cases, 57 were entirely healed or markedly improved. A temperature of 40° C. can only be borne when it is very gradually brought up to this point, and it is necessary to protect the external genital organs with ointments, because it is found that the vagina and cervix may bear, without pain, a considerably higher temperature than the external parts.

In order to prevent pain in the external organs during the injection of the hot water, Stratz has invented a special douche apparatus, so that the stream of flowing water is delivered directly against the cervix and vaginal fornices, and in its recurrent flow does not touch the external surfaces. This instrument is of hard rubber and funnel shaped; the conical portion of the instrument fits accurately in the vagina, and delivers the fluid directly against the vaginal fornix.

In order to obtain the best results the douche should at first be given by a skilled person, preferably a nurse. In giving the douche the temperature is gradually raised from 48° to 50° C., and at least four quarts

of the irrigating fluid are used daily. It is possible to raise the temperature to 60° C., but this must be most carefully done. To obtain the best results the pelvis should be slightly elevated. After the irrigation a tampon of glycerin, or potassium iodide with glycerin, should be applied. While this treatment may be left in the hands of some patients themselves, Stratz claims that the best results may only be obtained through systematic treatment by the physician himself.

From his polyclinic Stratz has selected seventeen cases, which he claims demonstrate the efficacy of this treatment, and from these I have selected a few as illustrative of its advantages and objections.

Case II. Young woman of twenty-six years, with tuberculous infection, salpingitis suppurativa dextra, perimetrosalpingitis, peritonitis adhesiva. Treatment began January 13, 1898, at which time the abdomen was extremely sensitive to the lightest touch; the patient suffered from nausea and vomiting and great weakness; the temperature was considerably elevated; a fluctuating, painful tumor was present in the right side, slightly movable and adherent to the surrounding intestines; the uterus was enlarged and retroverted, and the left adnexæ were thickened and very sensitive. Treatment consisted of daily hot douches at 48° C. and the envelopment of the abdomen with a moistened pad spread with ichthyl; every second day a warm bath was given. February 3d the pain was less, the tumor on the right side was smaller and denser, and adhesions had disappeared; the uterus was curetted, and in ten days the patient was discharged from the hospital. The patient reported twice weekly at the dispensary, and although the menorrhagia and the dysmenorrhœa, of which she formerly complained, had disappeared, nevertheless there was still pain in the lower abdomen and general weakness. She was then lost sight of for several months, but came back to the clinic still complaining, although her general condition was very greatly improved. The tumor, however, so far as its size was concerned, remained the same. In this case only an alleviation of symptoms resulted from the treatment.

It may be said that in such a case as this the treatment pursued was at best very questionable, and we see the results were by no means satisfactory. The thorough drainage of the pelvis through an incision posterior to the cervix, or an abdominal section for the removal of the pyosalpinx, would most likely have accomplished better results.

Case V. A woman, thirty-one years old, had puerperal infection, hydrosalpinx (left), and perioperitonitis adhesiva. As the result of an abortion in the second month the patient became highly feverish, suffered greatly with weakness, and had great pain in the lower abdomen. June 10th her temperature rose considerably above normal, and the uterus was found to be soft, enlarged, deviated toward the right, and excessively

tender on touch. The right adnexa were found normal ; the left adnexa were converted into a large, fluctuating, very painful tumor, which reached to within two fingers of the umbilicus ; it was slightly movable and adherent to the intestines. With extreme precaution the uterus was curetted and a mass removed, which proved on microscopical examination to be decidua. Following operation, hot douches, hot ichthylol compresses over the abdomen, and warm baths were employed. The tumor presented a clinical picture of an acute pyosalpinx. On the third day of the treatment the patient was without fever, and after one week pain disappeared. The bleeding ceased and the patient increased in strength rapidly and the tumor soon sank into the Douglas cul-de-sac. After fifteen days the patient returned home, where she continued the hot-water injections daily. March 9, 1899, the tumor was less painful and decreased considerably in size ; at this time she was admitted to the hospital, and the tumor was removed by a posterior incision in the vagina. Subsequent to this operation the patient became entirely well.

This case illustrates the value of this method so far as palliative treatment was concerned, but shows conclusively that when there is a large accumulation of pus the sac should be opened or removed. To follow this plan as a routine in such cases is certainly hazardous. The pus should be evacuated through a vaginal puncture.

Case VI. A woman of twenty-four years, who had pelviocellulitis and peritonitis adhesiva. Subsequent to an operation for appendicitis the patient suffered severely from peritonitis and right-sided perimetritis, which confined her to bed for two months. Admitted to the hospital August 20, 1898 ; she complained of great weakness, nausea, and vomiting. On the right side the appendages were found to be adherent to the caecum, and were excessively tender. Treatment was given of hot douches, pelvic massage, and hot baths. September 9, 1898, pain had disappeared, and there was no vomiting. After the pelvic massage the adhesions were still somewhat painful. October 15th the adhesions had disappeared ; there were slight adhesions of the right adnexa, but otherwise the organs were normal. January 9, 1899, the patient was well and strong.

It is in such a case as this that I look upon the treatment as being ideal and never to be replaced by operation.

Case X. A patient, twenty-two years of age, with post-puerperal infection, endometritis, perimetritis, and pelvioperitonitis adhesiva. Since the birth of her last child the patient had had severe pain in the left side and very abundant menses. December 18, 1898, it was found that the uterus was greatly enlarged and very sensitive, and the adnexa of the left side considerably thickened and adherent to the uterus through many adhesions. Curettage was done, the adhesions released under ether,

and the subsequent day hot douches were begun. In two days pain had disappeared. December 30th, after ten days' treatment, the pathological conditions had disappeared with the exception of a slight fixation of the left ovary. After eight days' further treatment pain had entirely disappeared. In two months the patient again became pregnant.

In this case there may have been some value in the hot-water treatment, although the operative measures may have brought about the good results. Certainly, in such a case as this the hot-water injection should be tried long enough to see what it will do.

Case XI. A woman, twenty years of age, who had tuberculous infection, left-side perisalpingitis, peritonitis adhesiva, and amenorrhœa part of the time. When the flow appeared it was accompanied by great pain in the abdomen, which had lately become more severe. January 7, 1899, the uterus was found in retroversion, fixed, and on the left side was a very sensitive, adherent tumor. The right adnexæ were normal. January 18th, after fifteen days' treatment with hot douches, there was only slight infiltration of Douglas' cul-de-sac and thickening of the tube, and the subjective condition was very good. On her return home the patient had a recurrence of the trouble, which, however, gave way to the same treatment, and on March 8th she was reported as entirely well.

As to permanent cure in such a case as this we are justified in having some skepticism, for a recurrence is likely to occur at any time. The freedom with which Stratz diagnosticates tuberculous involvement without a microscopical examination or a visual inspection of the peritoneum lays him open to the criticism of being somewhat haphazard in his diagnostic methods.

General Criticism. I believe the writer is entirely too optimistic as to the result of the treatment with hot vaginal irrigation. No doubt his remedy is of the greatest value in a certain number of cases, for I have seen most remarkable improvement from the employment of hot compresses and vaginal irrigations, but it nevertheless seems to me that the rapid disappearance of adhesions and inflammatory tumors of the adnexa reported in this series of cases borders upon the miraculous, and, therefore, should be very carefully proved by a large series of cases before being unqualifiedly accepted. Recent literature upon this subject certainly demonstrates very clearly that these remedies, which of late years have not been so freely used, should again be more generally employed. It is interesting to note that of these cases which Stratz reports the majority of them are young women. To relieve these cases without resort to radical operations is certainly much to be desired. For some time in my hospital cases where there is wide infiltration of the broad ligament with inflammatory deposits I have systematically

employed hot sand-bag compresses and vaginal irrigations with the most satisfactory results; but I do not accept the enthusiastic statement of Stratz, for it seems to me that he has erred in his judgment as a result of not having made an accurate diagnosis in all cases under narcosis, and therefore claims entirely too much for this remedy. To definitely define the areas of involvement, adhesions and the size of inflammatory tumors is extremely difficult in a conscious individual, and especially in nulliparous women such as he has treated; therefore, these diagnoses must be taken with a grain of salt. As I have stated, however, in my preliminary remarks, I am radically in favor of conservative measures first before resorting to the operative methods of treatment; therefore, in view of the fact that acute and chronic pelvic inflammatory cases do not, as a rule, demand immediate operation, but may with safety be submitted to conservative measures, this line should be first adopted, and in case of failure a final resort to operation may be recommended. This I believe to be a perfectly safe position to assume. If there is an accumulation of pus in the pelvis, be it in any form whatever, I believe nothing less than an evacuation will bring about a perfectly satisfactory cure. Notwithstanding the belief of some very good gynecologists as to the possibility of the absorption of the contents of a pyosalpinx, I think there is no question but that the surgical rule should be evacuation. If the tube can be evacuated through the vagina without its removal, the dictates of conservatism will be adhered to, and the patient will frequently make a good recovery. In reviewing Stratz's list of cases there is not a great deal to commend, for they do not appear to me to have been sufficiently accurately controlled or followed after they were supposed to be well.

TREATMENT OF INFLAMMATORY PELVIC EXUDATES BY MEANS OF COMPRESSION AND ELEVATED DORSAL POSTURE.

Within the last two years the treatment of inflammatory exudates by means of compression and heat has received renewed attention. For many years it has been customary in acute inflammatory conditions to use either hot or very cold compresses, more for the relief of the immediate pain than with the thought of bringing to a termination the inflammation.

It is usually found that domestic remedies which have been continuously used for many years have something of value in them, and now that we begin to study the scientific application of these remedies, it is frequently found that some are based upon good principles.

Among the large number of patients who have been operated upon in the last decade for pelvic inflammatory troubles we may always find

a considerable percentage who, while possibly relieved of the acute infection, still suffer from a residual inflammatory exudate. I have been especially impressed with this fact in the review of a large number of personal communications from patients who have been operated upon for the adherent appendages. Of all classes of cases these seem to give the least satisfactory ultimate results.

In this connection Sänger has spoken with no uncertain tone as to the fruitlessness of operating in these cases with the thought that an actual diseased process is being relieved, for these patients do not suffer from the pathological process, but from its effects, such as more or less dense adhesions between the obliterated tubes, the ovaries, and the surrounding organs; therefore, to merely break up these adhesions and remove the ovary and tube does little or no good, because even denser adhesions may be formed at the site of operation, and, in addition to the pain which frequently continues, the exaggerated symptoms of the meno-pause add still a greater burden to the afflicted patient.

It is this class of patients especially in which pelvic massage, passive movements, very hot irrigations, compression over the lower abdomen and the elevated dorsal posture are of special service. All of these remedies have been more or less used in the past, but not until quite recently in a distinctly methodical way.

Pineus¹ has written an extensive article on this subject, in which he gives a very comprehensive review of the literature and describes the methods which he now employs.

Fehling has also employed this same principle of heat and compression in the treatment of inflammatory exudates, applied in the form of a rubber bag, which is inserted into the vagina and filled with 800 to 1000 grammes of shot, with counter-pressure upon the lower portion of the abdomen with a shotbag weighing several pounds. This writer claims to have secured very good results from this method of treatment.

In Pineus' general summary of his method of treatment, and which appears from his literary review to be a selection of the best details of the methods of the past, he makes the following statements: In the treatment of inflammatory exudates in the neighborhood of the uterine appendages, in the perimetrium, in the pelvic connective tissue, and in the Fallopian tubes, operation, if possible, should be avoided.

If the operation becomes necessary as a final means of relief it should, if possible, be conservative in order that the menstrual function may be maintained. In working women unable to labor on account of extensive inflammatory disease of the uterus and appendages, radical opera-

¹ Zeitschrift für Geburtshilfe und Gynäkologie, 1898, vol. xxxix.

tion may be indicated for the purpose of immediate relief, so that they may resume their necessary duties.

In acute as well as in subacute and chronic inflammatory conditions the most important essential in a rational therapy is the complete emptying of the vascular system of the pelvic organs. According to Pineus, this is only to be secured through:

- a.* Increase of the abdominal blood-pressure.
- b.* Through acceleration of the recurrent venous flow.
- c.* Through assistance to the flow of the lymph stream by means of gravity.
- d.* Through an elevation of the pelvic organs and the dropping back of the superincumbent organs out of the pelvic cavity.
- e.* Through absolute rest of the diseased organs and their surroundings.

In order to accomplish all of these conditions for the rapid absorption of the pelvic exudate, Pineus has adopted a method of elevated dorsal posture associated with vaginal and abdominal compression. The inclination of the pelvis is secured through elevation of the foot of the bed 15 to 35 cm. (6 to 14 inches), which raises the bed to an incline of 12 to 30 degrees; higher elevation than this may be employed in exceptional cases for a short time. In general, the inclination is continuous during the treatment, except in recent puerperal cases, where, on account of the lochia and the necessary vaginal irrigations, it must be intermittent.

Compression is made through actual pressure, and the action of gravity is secured by the elevated posture. The abdominal compression may be made by elastic bandages, adhesive plasters, shotbags, potter's clay, 1 to 5 kilos (2½ to 12½ pounds). The vaginal compression is accomplished through inflatable air pessaries, colpeurynters, shotbags, etc. The compression may be intermittent or continuous, depending upon the individual characteristics of the case. In acute cases it must only be employed in conjunction with the dorsal elevation of the patient.

In chronic cases it may be continuously employed if the patient does not suffer too much pain and does not have elevation of temperature. It must always be intermittent if the patient experiences pain or has an evening rise of temperature.

Pelvic massage is of great assistance in the chronic stages. While this postural treatment with compression may be employed in all forms of plethora of the pelvic organs, its true field is in the treatment of chronic inflammatory exudates. In many cases of acute inflammation if used intermittently it may be of the greatest service.

It is contraindicated when there is tympanites or symptoms of general peritonitis. The duration of the treatment is from a few days to several months. Upon the character of the disease the prognosis depends. In chronic cases, where it is necessary for the patient to be on

her feet, it is possible to so modify the treatment that it may be conducted in an ambulatory fashion; this is accomplished through vaginal compression and elastic abdominal bandages. In all cases, however, there should be intermittent dorsal elevation of the pelvis during the day, and this posture should be assumed continuously during the night.

If, notwithstanding the employment of this postural and compression treatment, there is a continuance of fever and the patient begins to lose flesh, it may be necessary to remove the diseased organs.

During the past winter I have adopted a modified Pineus treatment in a number of cases. In one case there was an extensive inflammatory exudate following an abdominal section, performed in another hospital during the acute stage of infection of the Fallopian tubes. The entire pelvic floor was board-like in its hardness, and the uterus was so closely wedged in between the inflammatory exudate that it could not be outlined.

Preliminary to the Pineus treatment a puncture was made into the exudate and a small amount of milky fluid escaped, which contained virulent streptococci. The tissues were so hard and dense as to require a veritable tunnelling. Gauze drainage was inserted. Subsequent to operation a heavy sand-bag was constantly applied over the lower abdomen, and large quantities (one to two gallons) of very hot salt solution were given twice daily. In this case the recovery was rapid and perfect, and at the time of the patient's discharge from the hospital the uterus could be well outlined, and the induration in the pelvis had almost completely disappeared.

In a second case of old, indurated cellulitis (post-puerperal), in which there was a small amount of pus, a similar plan was carried into effect, with an equally gratifying result.

As a supplementary treatment to pelvic puncture in acute or chronic suppurative conditions, I think the Pineus method is excellent; as to its use without this preliminary, I am skeptical.

ULTIMATE RESULTS IN THE OPERATIVE TREATMENT OF RETROVERSIO-FLEXIO-UTERI.¹

Conclusions as to the ultimate results of various lines of treatment for any one condition may perhaps be best arrived at through the study of one man's experience. In a very careful review of the cases of retroflexion operated upon in Schauta's clinic in Vienna, Halban has considered the advantages and disadvantages of the various operations for this condition. One hundred and forty-seven cases, which were selected

¹ Monatsschrift für Geburtshilfe und Gynäkologie, January, 1900.

from 4000 cases of retroversion and retroflexion in the dispensary, were operated upon between the years 1892 and 1898. Of the 147 cases which were thus selected, only 83 were operated upon for this condition alone, the other 64 having diseases of the appendages which required relief.

In the following table are recorded the number and kind of operations which were performed :

		Cases.
1. Fixation of the uterus		108
A. Abdominal ventrofixation		43
a. According to Olshausen's method ¹		13
b. According to the Leopold-Czerny method ²		30
B. Vaginal methods		65
a. Direct		51
(Mackerondt's method)		10
(Duhrssen's method, extraperitoneal)		11
Intraperitoneal		30
b. Fixation of the round ligament according to Schauta's method		14
2. Shortening of the uterine ligaments		39
A. Shortening of the round ligaments		36
a. Through an abdominal incision		2
b. Through the inguinal canal		0
c. Through the vagina		34
B. Shortening of the sacro-uterine ligament		0
C. Shortening of the round ligament and the sacro-uterine ligament		3

In his criticism of the result of these various operations, Halban asks the question as to what we are to expect from an operation for the correction of retrodeviation of the uterus. In reply, he says that the operation must not only relieve the symptoms produced by the retroversion, but that the uterus when once changed from the vicious to the correct position must remain permanent. In the consideration of this latter question one of the most weighty features to be regarded is the possibility of subsequent pregnancies. All operations, therefore, must be so performed that they will give rise as little as possible to complications during pregnancy or parturition.

In considering the ultimate results in these cases, Halban considers, first, the relief of subjective symptoms. As I pointed out in my review of last year, there has been considerable discussion of late as to what symptoms are produced by retroflexion. Theilhaber, for instance, claims that a simple, uncomplicated retroflexion gives rise to no uncomfortable symptoms. It has been my opinion for some time that simple retroflexion, as a rule, induces much less subjective discomfort than has been attributed to it, but I by no means desire to take the radical position of Theilhaber and others.

¹ Suspension of uterus.

² Absolute fixation against the abdominal wall.

According to Halban, a large proportion of the cases operated upon have been completely relieved. In all of the operations the percentage of cures, so far as the patient's symptoms are concerned, is less than the anatomical cures, as, for instance, in the vaginal fixation operation of Duhrssen, in which in 80 per cent. of the cases a permanent anti-fixation was secured, while only 69 per cent. were relieved of their symptoms. In 76 per cent. of the cases in which the round ligaments were shortened the uterus remained in its new position, and only 61 per cent. of these patients were improved. This discrepancy between the anatomical and subjective cures is to be explained on the ground that the symptoms of a certain percentage of these cases have not been due to the malposition of the uterus, but to some other pathological condition. In a considerable proportion of these unsuccessful cases there has been at the time of the operation a slight inflammatory involvement of the appendages, which, however, has not been deemed worthy of special notice, or, as is occasionally the case, there has been a subsequent inflammatory involvement. Under these conditions the patient suffers from the complication rather than from the retroflexion.

In this list of unsuccessful results also belong the excessively nervous or hysterical cases. A brilliant cure may occasionally be obtained in these cases, but, as a rule, they are likely to develop all sorts of bizarre symptoms. There is no class of cases which should be more carefully studied before resorting to operation than these excessively nervous women, for in many instances the symptoms which may be attributed to the malposition of the uterus are simply one evidence of the general neurotic involvement. For every successful case of this nature I am certain we will find many unsuccessful ones as offsets. In the natural history of these cases the operation does one of two things—either relieves partially or completely the symptoms or renders them worse. When, for instance, the patient herself has attributed all the nervous symptoms to the malposition of the uterus, and is not relieved after the operation, she is likely to become profoundly depressed and considers herself a hopeless invalid. These are the cases, therefore, in which the most careful judgment should be exercised.

In general, Halban comes to the conclusion, after his review of the results in Schauta's clinic, that the subjective results correspond with the objective ones, for in those cases in which the uterus is held permanently in a correct position the patient is usually relieved.

Under the head of objective results, Halban considers carefully all the various methods of operation which have been performed, and concludes that at least one year must elapse before we may look upon a case as permanently cured. While recurrence is usually noted within two to three months after the operation, in some instances it may be delayed

six or eight months. A second group is also noted in which the recurrence follows a subsequent pregnancy. In his summary of the results of the various operations he finds a permanent cure as follows:

Ventrofixation	87 ⁵ / ₁₀ per ct.
a. According to Leopold's method	90 per ct.
b. According to Olshausen's method	83 ⁴ / ₁₀ per ct.
Vaginal fixation :	
a. Mackenrodt's extraperitoneal method	14 ³ / ₁₀ per ct.
b. Duhrssen's extraperitoneal method	27 ³ / ₁₀ per ct.
c. Duhrssen's intraperitoneal method	80 per ct.
Shortening of the round ligament :	
a. Wertheim-Bode method	76 per ct.

From this total it will be seen that none of the methods which have been employed insure absolute retention of the uterus in its new position. There is, however, a very great difference in the permanent results obtained after the different methods. In Mackenrodt and Duhrssen's extraperitoneal methods there are so many recurrences compared with the successful cases that these operations should be permanently set aside. The results in the ventrofixation according to the Olshausen method (83.4 per cent.), the vaginal fixation according to Duhrssen's intraperitoneal method (80 per cent.), and the vaginal fixation of the round ligament according to the Wertheim-Bode method (76 per cent.) closely coincide, and it is, therefore, of considerable interest to know what Schauta's general conclusions are as to his choice of these three.

As to the permanent results subsequent to pregnancy in these cases, Halban is unable to give any definite information; he is, however, in a position to discuss the question as to the course of these cases during pregnancy and parturition. Of 64 cases, 22 became pregnant subsequent to operation; these constituted the uncomplicated cases of retroflexion. In 18 complicated cases, 3 became pregnant (one after the extirpation of a dermoid cyst, another after the extirpation of a strangulated ovarian cyst, and the third after the enucleation of a myoma). In 22 cases abortion occurred in 4 (one after Duhrssen's extraperitoneal method, one after Duhrssen's intraperitoneal method, and two after the Wertheim-Bode method). In two of the cases which aborted enucleation of a myoma had been performed, and in the other there was an endometritis, which was possibly responsible for this accident. In all of the cases which went to term none complained of untoward symptoms, and in all except four the labors were normal. In one case the Braxton-Hicks method of version was necessary, on account of placenta praevia, and the forceps was used in another case. In two cases considerable difficulty in the labor was directly attributable to Duhrssen's intraperitoneal vaginal fixation method, and consisted in over-distention of the

posterior wall of the uterus and the high position of the cervix, which prevented a normal presentation; in both cases version was necessary, as the result of which one child was lost.

In the choice of methods, Halban finds that in the first years of the operative treatment of retroflexion, ventrofixation was almost exclusively done, but that in the last year the vaginal method has taken its place. The reasons given for this substitution are, first, avoidance of an abdominal incision and its possible untoward results, such as suppuration, hernia, unsightly cicatrices, etc. Second, less danger of peritoneal infection and a more rapid healing of the wound. In their later experiences the abdominal method has only been employed when it was necessary to treat some complication. In the treatment of uncomplicated retroflexion cases Halban says that the vaginal method of shortening the round ligaments is invariably the operation of election. This method, while perhaps more difficult to carry out, nevertheless possesses the advantage over the other vaginal fixation methods of not producing any untoward results in case pregnancy occurs. He strongly condemns the extraperitoneal fixation of the uterus, as suggested by Mackenrodt and Duhrssen, because of the bad results. Even if better results were obtainable from this operation, Halban still claims that the operation is unjustifiable, as it is a blind surgical procedure which may result in the injury of the intestines or bladder. The only advantage which it possesses is that of not opening the peritoneal cavity. If an operation is to be carried out carefully this advantage need not be taken into serious account, for we do not now look upon the opening of the peritoneal cavity under careful precautions as a dangerous procedure.

The Alexander-Adams operation has not been performed in Schauta's clinic, first, because it is only of value in uncomplicated cases, and, second, because it possesses no advantages over the ventrofixation by abdominal incision. Under only two conditions does Halban consider the Alexander-Adams operation indicated, first, in uncomplicated retroversion in an unmarried woman, and, second, when an inguinal hernia which requires treatment is associated with the retroversion.

With regard to the question of what cases of retroflexion are to be operated upon, Halban says all cases should be treated in this way when it is necessary to perform coeliotomy for an associated complication. In uncomplicated cases it is indicated when the retroversion is rendered permanent on account of adhesions which have not given way to massage, forcible rupture of the adhesions, etc., and also in mobile retroversion where the use of the pessary has given poor results. In the larger clinics patients are not infrequently seen who live some distance from a physician, and who cannot, therefore, have pessaries properly looked after, under which conditions it is often necessary to operate to relieve them

from their discomfort and to obviate the dangers of wearing a pessary without careful supervision.

In determining what cases should be operated upon, Halban says the first point to be considered is whether the retroversion is complicated or uncomplicated. If the uterus can be replaced by bimanual manipulation a pessary may be tried; if this is not successful a colpeurynter filled with quicksilver is introduced into the vagina and the patient is placed in the elevated dorsal position. In this way remarkably good results have been obtained. If one fails in this manipulation then it is possible in some instances to relieve the retroflexion through massage or by forcible rupture of the adhesions according to Schauta's method. When these various procedures prove unsuccessful operation is advised.

Criticism. In my review of the subject of retroflexion last year I felt that the evidence was sufficiently strong against the employment of the Duhrssen and Mackenrodt methods to induce me to strongly advise against them. With regard to the Wertheim-Bode method, however, it appeared to me that good results might be obtained, and in this connection I said: "If it proves that the Wertheim method gives permanent results I can see no objection to its adoption in cases of retroflexion associated with relaxation of the vaginal outlet, in which a plastic operation is also to be performed."

As a result of a careful review of these cases operated upon in Schauta's clinic, it is evident that the shortening of the round ligaments through a vaginal incision has proved effective; nevertheless, if we are to be upon the safe side it is still well to wait further results before adopting this method. Unquestionably it is being put to a complete test in the German and Austrian clinics, and I have no doubt that before a year has passed we will be in position to speak more definitely as to the ultimate result.

The operation as it is now performed consists in snipping a hole between the bladder and uterus, opening the peritoneal cavity, hooking down the round ligaments, and putting a sufficient number of pleats in them to bring the uterus up into normal anteposition. One possible objection which appeals to me is that the constant dragging upon the round ligaments, unless the uterus is well supported from below, will sooner or later draw them out into more or less attenuated cords and permit the uterus again to drop back into Douglas' cul-de-sac.

The evidence in favor of this operation seems to be sufficient to justify one in adopting it in favorable cases. The cases which I look upon as favorable are those in which there is a tendency to descensus, with retroflexion and a marked relaxation of the vaginal outlet. In conclusion, however, I still consider it is well to offer the same cautionary

advice not to be too hasty in adopting this operation until its ultimate results are more definitely known.

CHRONIC INVERSION OF THE UTERUS.

At the present day the care of obstetrical patients has become so much more scientific than in former times when midwives and unskilled physicians attended them, that such a complication as inversion of the uterus, which is not promptly recognized and replaced, is very rare. When this accident is allowed to become a chronic condition it is frequently impossible to replace the uterus by manipulation, and, therefore, it is necessary to resort to operation.

The three plans of treatment which are usually adopted, one after the other, are, first, as already indicated, the manual effort; second, vaginal amputation of the prolapsed uterus; third, opening Douglas' cul-de-sac and incising the sac from fundus to cervix and reinverting. The operation which has been most frequently performed is that of Küstner; in this operation the peritoneum is opened posterior to the uterus, and the neck of the sac is incised, relieving the constriction and making it sufficiently large to reinvert the fundus.

Quite recently Hirst¹ has reported an interesting case, in which he instituted a new operative procedure. The patient was delivered for the first time after a prolonged and painful labor, but without instruments; the placenta was adherent and was manually detached. The patient, according to her own story, immediately lost consciousness and remained unconscious for forty-eight hours. The attending physician attempted a reposition of an inverted uterus, but failed, and the next day a gynecologist, who was called in consultation, had no better success. The following day the attempt was repeated under ether, but again failed.

On examination Hirst found a complete inversion, good involution, and a very firmly contracted cervix. He determined to try taxis under ether, and, in the event of failure, to sever the cervix and replace the uterus. Success in four other cases by taxis alone encouraged him to hope that the operation might not be necessary. In this procedure he failed completely. The cervix was then incised in the median line posteriorly, the incision being carried higher on the internal than on the external surface, the ring muscle being thus almost, if not completely, severed without opening the peritoneal cavity. Then comparatively light pressure, with one finger-tip on the lower uterine segment just above the upper angle of the wound, easily reinverted the uterus. The

¹ A New Operation for Persistent Inversion of the Uterus: American Journal of Obstetrics, 1900, vol. xli., No. 1.

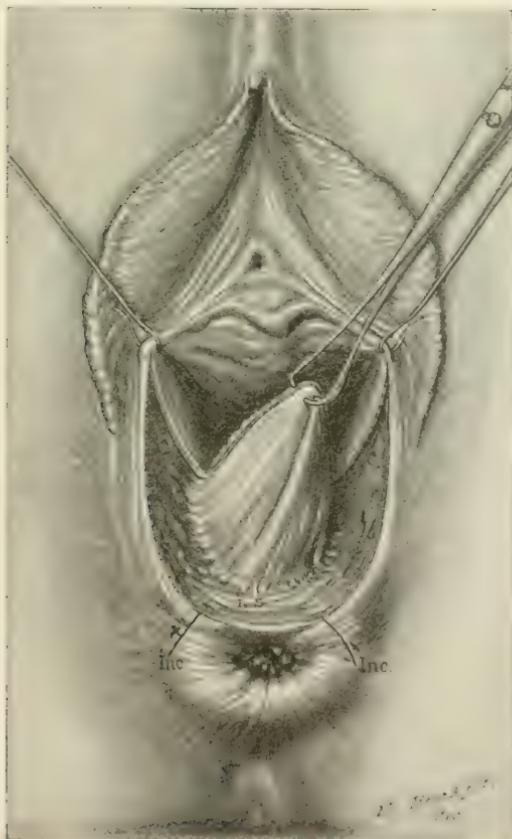
cervix was then repaired by sutures. The whole operation scarcely required fifteen minutes. The patient has made an afebrile recovery, and the uterus remains in good position.

In a personal communication from Dr. Hirst, he draws attention to the fact that operations similar to this have been performed in the past, but makes the point that the probable reason why these operations have, as a rule, failed, is because the incision through the cervical muscle has not been deep enough to release the constricting band.

COMPLETE TEAR OF THE PERINEUM.

While the method of repairing a complete tear of the perineum as devised by Emmet gives most satisfactory results in a large majority of

FIG. 52.

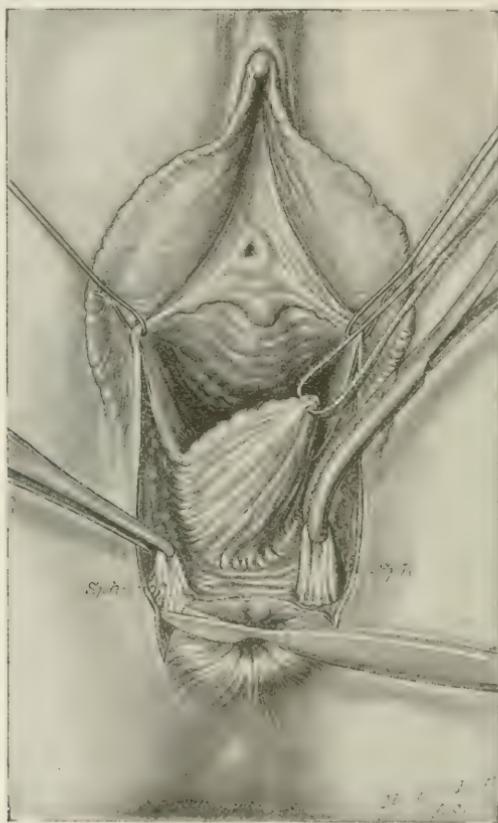


The denudation on vaginal and perineal surfaces. The tongue of tissue in the middle lifted up and dissected loose from the internal sphincter (i. s.). The denudation does not, however, expose the external sphincter, which is in this case laid bare by the two incisions (Inc.) parallel to the anal orifice. (KELLY.)

cases, failure occasionally occurs, and frequently the result is imperfect, or at least this has been Kelly's experience, which has been duplicated by other operators.

One of the chief failures in this operation is that complete control of the bowel is not re-established, and as a result the patient is unable to retain flatus. Kelly attributes this failure to the fact that the gap between the sphincter ends has filled in with cicatricial tissue, which

FIG. 53.



The incisions made as shown in Fig. 52 and the sphincter ends bared by dissection.
(KELLY.)

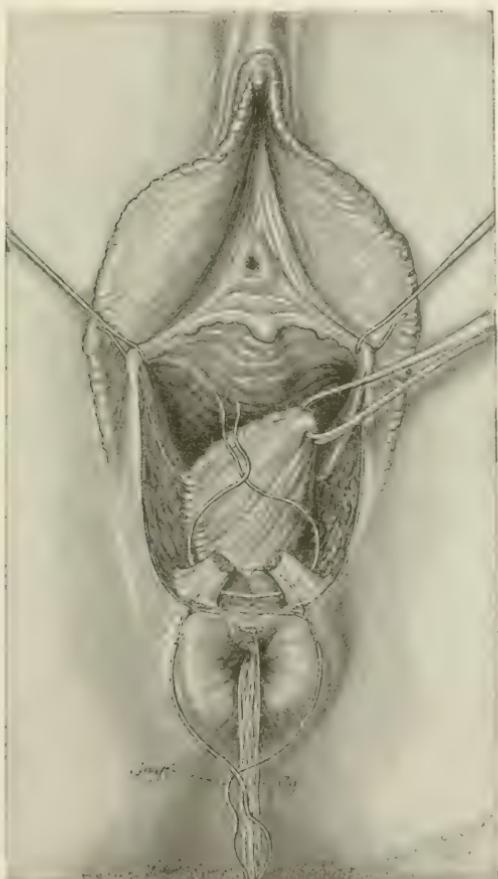
prevents the restoration of the divided ends of the muscle to their original integrity.

The plan now adopted by Kelly¹ follows the principle described by Dr. James Collins Warren, of Boston, in the *Boston Medical and Surgical Journal*, January 3, 1878. The new operation is performed as follows (Fig. 52):

¹ The Johns Hopkins Hospital Bulletin, 1899, Nos. 94-96.

“An incision is carried across the septum at least a centimetre—more if the tear is a deep one—above the margin between the junction of the rectal and vaginal mucosa. This incision extends across the whole septum and above and beyond the sphincter ends. Taking this as a base line, the operation on the vulvar and vaginal portion of the rent

FIG. 54.



Denudation completed and rectal sutures tied, uniting the internal sphincter and radiating out into the skin surface. (KELLY.)

is then made in the usual manner, as in the case of repair of an ordinary relaxed vaginal outlet. Having completed the denudation of these parts, with the bilaterally symmetrical triangles in the sulci and the undenuded tongue of tissue on the posterior column, the operator then turns his attention to the complicating condition—the rectal side of the tear (Fig. 53).

"He inserts his left index finger into the bowel and draws the septum a little forward, and then carefully dissects the strip of undenuded tissue described above so as to free it and to turn it down like an apron. A carefully conducted dissection will expose the internal sphincter muscle and avoid buttonholing the bowel. At the sides of this flap the ends of the sphincter muscle are caught up and liberated.

FIG. 55.



Showing skin flap held down and sphincter ends united by three interrupted catgut sutures. This was a case of deep injury of the sphincter without tear of the skin over the anus and without a tear into the lumen of the bowel. (KELLY.)

The purpose of this flap is to turn down an apron or fold of tissue which, when the sutures are all in place, projects out of the anal orifice and points in a direction away from the impact of the fecal masses. By making this apron the operator is able to avoid the presence of a wound on the rectal surface, and thus the most serious complicating condition is removed. When the denudation is complete and the apron turned

down, the operator will then be able to avoid the second complication, the presence of a dead space in the centre of the septum, by the following plan of suturing. About three or four catgut sutures are applied in the form of the figure-of-eight, beginning above and introducing each suture so as to grasp the fibres of the internal sphincter muscle well to one side of the median line sutures, then carried to the opposite side, then passed through the tissues in the septum well above the internal sphincter; it then returns to the first side and includes the corresponding areas of tissue, and is finally brought out through the internal sphincter at a point corresponding to the point of entrance (Figs. 54 and 55). This entire suture is buried in the septum, and no part of it appears on any part of the surface. By the use of three or four sutures of this kind,

FIG. 56.



The rectal sutures all in place and the sphincter (Sp) ends united by three buried catgut sutures. A silkworm gut tension suture passes through the centre of the sphincter muscle up around through the septum. (KELLY.)

broad, plain surfaces are brought together in the middle of the septum, and the space is obliterated in which accumulations are so apt to form (Fig. 56). The use of this figure-of-eight suture in this way takes the place of a much larger number of interrupted sutures, and, moreover, instead of securing a thin line of union, with weak spaces between, approximates planes.

“After uniting the centre in this way as the first important step in the suturing, the next step is to pass the sutures on the vaginal surface, approximating the triangles there. The next sutures are applied on the perineal surface, and here Kelly commonly uses two or three common silkworm-gut sutures in addition to the catgut sutures between them.

"The final step in the operation is the union of the edges of the apron, which lie now more or less crumpled together and projecting at the anus; by leaving these sutures long and making slight traction this entire line can be drawn well outside and fixed on the buttocks by a strip of adhesive plaster."

This plan of treatment is no doubt of great value. The only possible objection which appeals to the reviewer is that there might be an increased liability to local necrosis of the sphincter ends, due to the constriction of the catgut which binds them together and to the fact that they are dissected out of a bed of tissue and replaced in another location where the vascular supply may not be so rich. This naturally is a theoretical objection, and practical experience may demonstrate the fallacy of this hypothesis.

THE EARLY USE OF PURGATIVES AFTER ABDOMINAL SECTION.

All improvements in after-treatment of operative cases which render the patient more comfortable are much to be desired. Among the minor complications which we always have to fear are thirst, excessive vomiting, and more or less obstinate constipation.

Through the employment of salt solution enemas and the peritoneal infusions, patients may be almost entirely relieved of excessive thirst. It has been, however, a question at what time to give the purgative in abdominal section cases in order to obtain the best results. If delayed too long the intestines may become very much distended, and in some instances a life may be lost through excessive tympanites. In these cases the patient has severe pain and the pulse becomes rapid, although there is no excessive elevation of the temperature. When death occurs it is found on autopsy that there is no peritonitis, and that the patient has succumbed apparently to the excessive distention and probably also to the absorption of intestinal contents, which may produce a very toxic effect.

Ramsay¹ has carried out a very careful series of observations in the wards of the Johns Hopkins Hospital in order to determine the time and the best methods of evacuating the bowels after abdominal section. The routine after-treatment when he began his observations was to give no purgative and to make no attempt to move the bowels until the evening of the day following the operation, when the patient was given 2 grains of calomel, either in one dose or in divided doses at one-half-hour intervals. This was followed in the morning by a warm soapsuds

¹ American Journal of Obstetrics, 1899, vol. xl., No. 1.

enema, containing one-half ounce of glycerin. In these patients, almost without exception, there was considerable distention on the second evening, the epigastric region being tense and hard; the patients had also, usually, a good deal of general abdominal pain with eructation of gas, and probably were somewhat nauseated. Usually three enemata were needed to be effectual, and it was commonly the fifth or sixth day before the patients were comfortable, the distention gone, and flatus passing freely.

Ten control cases were treated according to the old régime, being given 2 grains of calomel at 8 P.M. on the second day, followed by a warm soapsuds and glycerin enema at 8 A.M. on the third day, which was repeated until the bowels were moved and flatus passed freely. Among these 10 patients, two enemata were sufficient in 1 case, three were necessary in 6 cases, four in 1 case, and five in 2 cases; and 8 out of the 10 were noted as comfortable on the fifth day, the distention and accompanying nausea and vomiting having disappeared. One patient was not comfortable nor free from distention until the sixth day, and one not until the seventh.

The first innovation by Ramsay was in the preparation of the intestinal tract previous to operation. As soon as the patient was admitted to the hospital, unless there was some special contraindication, a purgative was given, and on the day before operation one-half ounce of Epsom salts was ordered, to be followed in an hour by a second half-ounce. Six hours later a soapsuds enema of about one pint and a half, containing one ounce of glycerin, was given, and at 11 or 12 o'clock the same night another soapsuds enema followed. The patient was permitted to take only a liquid diet, consisting chiefly of albumin, for at least twenty-four hours before operation, and nothing after midnight, save, possibly, a half-ounce of sherry just before going to the operating-room. Following the routine method, quite an improvement in the condition of the bowels, consisting of lack of distention and complete emptiness, was noted. The after-treatment was changed to administering 2 grains of calomel at 6 o'clock in the morning following the operation, and at 4 o'clock in the afternoon a soapsuds enema, containing 1 ounce of glycerin, was slowly injected, using a rectal tube passed some distance up into the bowel. Usually a second enema of the same kind was ordered in the early morning if the patient was uncomfortable or distended, and later a third or fourth if necessary.

Thirty consecutive cases were treated in this way with the following results: One enema was sufficient in 2 cases; in 10 two enemata were sufficient, in 13 three were employed, in 11 of which the patients were still uncomfortable, though the first two were partially effectual. In 4 cases four enemata were necessary to completely empty the bowel and

relieve the distention, and in 1 case six repetitions of the enema were necessary.

So far as the comfort of the patients was concerned, 7 were comfortable and free of distention on the third day, 14 on the fourth day, 7 on the fifth day, and 2 on the sixth day.

In explanation of what he means by comfortable, Ramsay says that the nausea had entirely ceased, the distention had disappeared, and the abdomen was soft and free from tenderness.

On comparison of the results obtained in these cases with those of the past it was found that the patients were much more readily relieved and no added dangers were noted as the result of the early interference with the bowels. It is also noted that, contrary to the general opinion, early attempts to move the bowels do not add to the discomfort suffered by the patients immediately following operation, but rather tend to lessen them. In numerous instances threatening symptoms disappeared immediately on the successful institution of this treatment. As the result of his experience Ramsay found that the best enema consisted of 1 pint of soapsuds, 1 ounce of glycerin, and 2 drachms of spirits of turpentine. It was also found of advantage to administer on the evening of the second day some simple remedy to keep the intestinal peristalsis active. Several forms of enemata were employed, but with no better results than the one given above.

A plan for the early evaeuation of the bowels has also been proposed by Byford,¹ which Ramsay employed in eleven consecutive cases. This method consists in the careful dieting and preparation of the patient and the administration of the purgative immediately before operation. As soon as the patient recovers from the anæsthetic after operation, drachm doses of Epsom salts are given every hour, and a small glycerin and warm-water enema after the sixth dose of salts. The salts are continued after this every hour, with an enema every fifth hour until the bowels are moved and flatus passes spontaneously. In eleven cases in which Ramsay observed the effects of this method he obtained satisfactory results. Contrary to expectation, no nausea followed the administration of the small doses of salts, which was not in accord with the observations of the past.

According to the old method, however, large doses of salts were usually given, and in this method small doses frequently repeated were the rule. Instead of increasing, not infrequently the nausea was allayed by the use of the salts. Ramsay offers the criticism that the patients complained bitterly of thirst and that there was a tendency to nausea and constipation on the fourth or fifth day. The excessive tympanites,

¹ American Journal of Obstetrics, July, 1898.

which is noted after some operations, and which resulted in death in two cases observed by Ramsay, is attributed by him to excessive manipulation of the intestines.

The entire object of Ramsay's and Byford's methods of treatment appears to be, therefore, to overcome this tendency to abnormal distension of the bowels.

In concluding Ramsay remarks that :

" 1. It is important both for the welfare of the patient and for the comfort of the operator to attend carefully to the diet and to the thorough emptying of the bowel before any abdominal operation.

" 2. That the bowels should be moved and the distention relieved soon after operation, both for the comfort of the patient as well as to avoid possible dangerous complications.

" 3. That in the simpler groups of operations, such as suspension of the uterus, myomectomies, the removal of uncomplicated ovarian tumors, and in uncomplicated hysterectomies, the administration of calomel and the use of enemata on the second day are followed by a perfectly satisfactory convalescence.

" 4. That in cases of beginning peritonitis, in cases where numerous adhesions have been broken up, or large, raw areas left, in cases where the intestines have been freely handled or long exposed, and, finally, in emergency operations, where no previous preparation can be made, Dr. Byford's method of immediate purgation is indicated."

It gives me pleasure to say that this plan, which has been suggested by Ramsay, according to my experience gives most satisfactory results and is worthy of general adoption. The care of the bowels subsequent to a serious abdominal operation is of paramount importance and should never be neglected. As is proved by this investigation of Ramsay's, the earlier the use of the purgative after abdominal section, within reasonable limits, the better.

THE CAUSE AND SIGNIFICANCE OF UTERINE HEMORRHAGE IN CASES OF MYOMA UTERI.¹

The almost unlimited and unclassified literature dealing with the subject of myoma uteri in its various aspects renders wellnigh impossible a selection of the special work upon this topic.

Wyder,² whose conclusions concerning hemorrhage in cases of myoma uteri were drawn from the study of twenty cases, attributed this symptom to endometritis induced through the presence of the tumor. Accord-

¹ The Johns Hopkins Hospital Bulletin, 1899, Nos. 94-96. The article has been cut down and only the essential details of my research have been quoted in this review.

² Archiv für Gynäkologie, Bd. xxix.

ing to him, the thicker the muscle which separates the myoma from the uterine cavity the less frequently will the circulation be changed and the more pronounced becomes the growth of the uterine glands without participation of the interglandular connective tissue. On the other hand, the nearer the tumor approaches the uterine cavity the more frequently occurs the growth of the interglandular connective tissue, which may leave the glands intact or induce complete atrophy.

So long as the endometritis, which, according to his opinion, is a constant accompaniment of these tumors, is confined solely to the glands, and the interglandular tissue remains approximately normal, hemorrhage will not occur, and it will only arise when both constituents of the endometrium undergo an increase (Olshausen's endometritis fungosa), or when the one or the other grows excessively, or, finally, when in addition to the endometritis glandularis there is also an interstitial inflammation.

As is at once evident, Wyder's views are not tenable, for, as stated by Semb,¹ the tumor, being an innocuous one, cannot of itself induce an inflammatory process in the endometrium.

In the examination of twenty-three cases in Leopold's clinic Semb found in many instances absolutely no evidence of endometritis, and in those cases in which an inflammatory process occurred he considered it merely as secondary to the tumor. From his histological examination he concludes that the mucosa undergoes hypertrophy without preceding inflammation, consisting either of a uniform increase in both the stroma and the glands, or the glandular changes may predominate. After re-viewing each of his cases, he says hemorrhage will not arise, notwithstanding the most marked changes in the endometrium or increase in the size of the tumor, if the walls of the tumor show no hypertrophy. According to this view, therefore, the hemorrhage depends upon hypertrophy of the uterine musculature with accompanying pathological changes in the vessels.

Schmal² arrived at the following conclusions concerning the changes in the uterine mucosa from the study of fifteen cases. First, in subserous myomata the mucosa may remain normal or become hypertrophied. Second, in interstitial submucous tumors the mucous membrane becomes atrophic over the tumor and hypertrophic opposite the tumor. No opinion is expressed concerning the occurrence of hemorrhage in these cases.

Borissoff,³ from a study of twenty-one cases of fibromyomata, reached the following conclusions:

¹ Archiv für Gynäkologie, Bd. xlvi.

² Archiv de Tocologie et de Gynécologie, Tome xviii.

³ Inaug. Dis.: "Ueber die Veränderung der Uterus-Schleimhaut die Fibromyomata in Verbindung mit Uterusblutungen," St. Petersburg.

1. In fibromyomata the mucosa shows a pronounced sclerosis, which in many cases induces a complete atrophy of the mucosa.
2. Glandular endometritis is relatively seldom observed. It occurs more often in combination with interstitial endometritis.
3. The influence of the tumor upon the mucosa depends entirely upon its position in the uterine wall and upon its size. If the tumor has reached a certain size it induces through mechanical influence a stretching and atrophy of the mucosa.
4. Bleeding from the uterine cavity results from stagnation of blood in the mucosa, and occurs mostly per rhesis of the vessels which have undergone pathological changes.
5. The inflammatory changes in the mucosa, with the congestion and hemorrhage, lead to a desquamation of the epithelium.

Schauta,¹ at a more recent date, states in his text-book that hemorrhage seldom occurs from the myoma or its capsule; erosions of the covering layers of the tumor may, however, lead rapidly to fatal bleeding from the large sinuses. Changes in the mucous membrane play the principal rôle, and of these changes hypertrophy takes a much less part than the degeneration of the mucosa and its vessels. This degeneration consists in a thinning, necrosis, and erosion of the tense mucosa over the tumor as well as changes in the bloodvessels, which lead to the occlusion of some, to the widening of others, and to the rendering of the loops of the vessels brittle.

According to my observations, this is a very concise statement of the subject, and conforms in general, as do the conclusions of Borisoff, with those which I have reached.

With a view of throwing more light upon this subject or at least of confirming the results of some one of the preceding investigators, I began three years ago the study of the macroscopic appearances in conjunction with a close analysis of the clinical history of specimens of myomata removed by hysterectomy.² The observations, however, upon which I relied most for my conclusions were made in a series of ten artificial injections of the principal varieties of tumors. In the early clinical study of these cases I had frequently noted that the mere size of the tumor bore absolutely no relationship to the amount of hemorrhage, for in some instances tumors as large as the pregnant uterus at term had been accompanied at no period of their development by this symptom, while, on the other hand, tumors so small as not to be perceptible to the patient have induced such excessive bleeding as to require operative treatment most urgently. Again, the frequency of hemorrhage

¹ Lehrbuch der Gesamten Gynäkologie, 1896.

² The Johns Hopkins Hospital Bulletin, 1899, Nos. 94-96.

accompanying the subcutaneous tumors and its absence in the subperitoneal types was self-evident.

In view of these general observations, and the fact that on section myomatous tumors, as a rule, show a very poor vascularization, the explanation of the hemorrhage does not appear at first sight to be due to the tumor *per se*, but to mechanical disturbances induced in the uterine circulation through its presence. Myomatous tumors, as is well known, present a most remarkable morphological diversity ; their size, form, and position being subject to the widest variation from any fixed standard of development, due not to deviations from their primitive histological basis, for within narrow limits they conform more or less closely to a uniform microscopic type, but to variations in their gross anatomy.

In view of the heterogeneous growth of these tumors it would appear evident that any rule governing the hemorrhage which has a mechanical basis for its support must present many variations. The atypical bleeding in cases of myoma uteri may manifest itself, therefore, as an increase in the catamenial flow or as profuse and irregular intermenstrual hemorrhages. Were the tumor itself to possess inherent characteristics which induce hemorrhage, it goes without saying that in all cases this symptom would occur. The fallacy of the latter hypothesis is demonstrated by a tumor, a picture of which has already appeared in Kelly's *Operative Gynecology*.¹ It is a large angiomatous myoma, occupying the wall of the uterus, but not impinging upon the mucosa, and, notwithstanding the excessive vascularization, the patient did not suffer from hemorrhage, but came to operation simply on account of the steady increase in the size of the tumor.

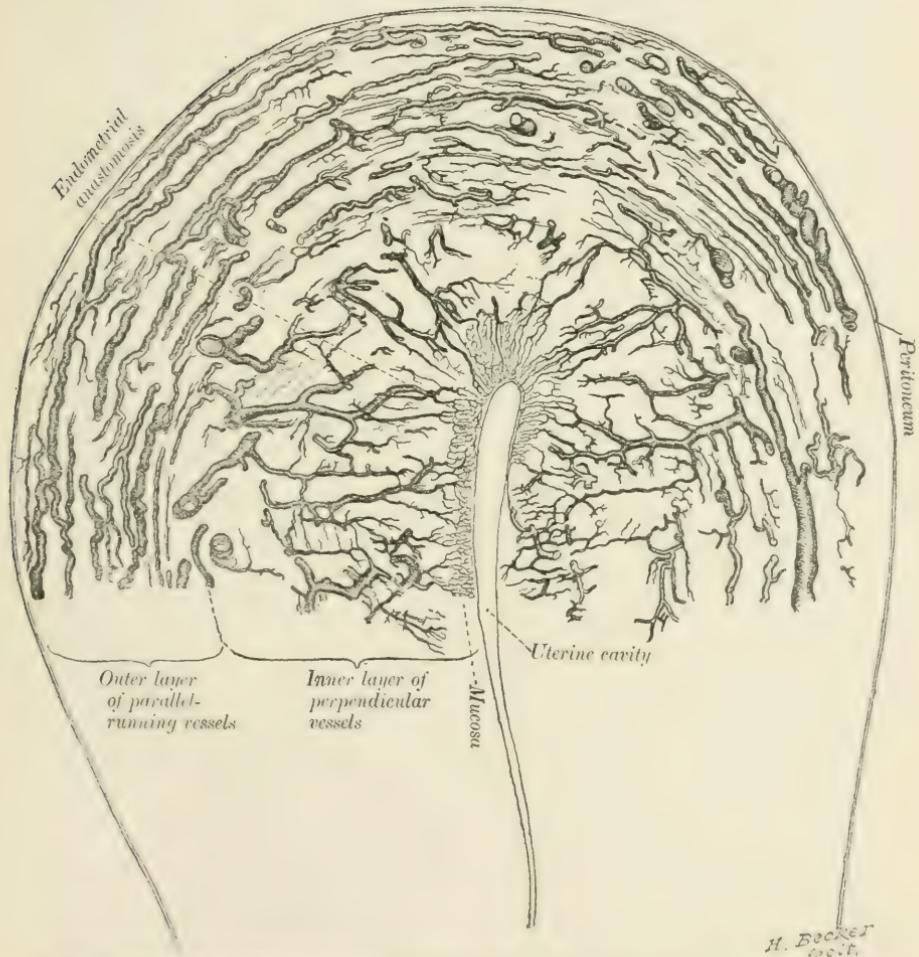
Accepting as an axiom that "to determine the abnormal one must know the normal," it appeared to me absolutely essential to ascertain first the normal scheme of the uterine circulation before attempting to arrive at any conclusion concerning the changes induced in it by the growth of the myomatous tumors.

The Normal Circulation of the Uterus. The most commonly copied picture of the circulation is that of Hart and Barbour (Gray's *Anatomy*), which represents the uterine and ovarian arteries as a thick, tortuous, communicating system lateral to the uterine walls, giving off branches, which in turn quickly break up into tiny vessels terminating in a fine capillary anastomosis in the median line of the uterus. From this cut, as well as from the descriptions by the majority of writers, it would appear that not only is there a poorly vascularized median line, but that there is little, if any, commingling of blood from the two sides except through this capillary anastomosis.

¹ Vol. ii., opposite p. 382.

As a result of my observations on the normal vascularization of the uterus, I may epitomize by saying that it consists of the lateral utero-ovarian anastomosis, which gives off excessively tortuous secondary

FIG. 57.
Fundus



Sagittal section of uterus, showing the scheme of the arterial distribution. The parallel vessels of the external muscular layer freely anastomose among themselves. From the innermost arteries branches are given off at right angles which penetrate the inner muscular layer, supplying it with numerous anastomosing nutrient vessels, and finally terminate in a rich capillary supply to the endometrium. (CLARK, *The Johns Hopkins Hospital Bulletin*, 1899.)

branches, some of which penetrate the outer layers of uterine muscle, and finally terminate as delicate wings in the uterine mucosa, while others extend across the uterus, and, fusing with similar branches from

the opposite side, form direct arterial communications (Fig. 57). From the latter, branches are given off which also penetrate the deeper-lying musculature and terminate in the mucosa.

The Mechanical Disturbances in the Circulation in Cases of Myoma Uteri. From this study of the circulatory changes in uteri, the seat of myomata, I am convinced that the increased menstrual flow and atypical hemorrhages which so frequently occur in these cases are dependent solely upon mechanical conditions, which induce, first, a congestion of the deeper-seated muscular and endometrial vessels, and this in turn to an increase or prolongation of the menstrual flow, and, second, an actual derangement or disorganization of the vascular system of the endometrium and of the tumor itself, through which atypical hemorrhages occur, varying in degree from a slight intermenstrual discharge to a loss of blood so great as to cause the most prostrating or even fatal anæmia.

First, as to the part played by mere venous stasis in the production of the increased menstrual flow.

In its natural history the uterus, after puberty, passes through its successive menstrual cycles with the attendant sanguineous flow. According to some observers, this flow is due to an actual rupture of the capillaries of the endometrium, while others believe that it occurs through a simple diapedesis. The latter view is held by Cullen, who has reached this conclusion after an extensive study of the endometrium in all of its normal and pathological conditions.

With this well-sustained theory before us as a working basis, the explanation of the increased menstrual flow in cases of myoma uteri is comparatively easy. In their early growth these tumors appear as minute whitish bodies lying in the depths of the uterine muscle. In all of my injected specimens the smallest tumors, some of them not larger than a pea, show a remarkably poor internal vascularization in comparison with the surrounding musculature. The tumor apparently starts as a whirl or kink in the fibres of the muscle, and is not, according to my observations, supplied by a central vessel, as stated by some writers, but derives its blood-supply from vessels coursing between the surrounding fibres. This insignificant initial wreath grows into a thick network of encircling vessels which send radiating branches into the interior of the tumor. In the progressive development of the tumor the increase in the blood-supply is not commensurate with that of the tumor, which leaves its centre sooner or later more or less isolated from the peripheral source. With the increasing size of the tumor it follows the simple mechanical law of pushing in the line of least resistance, and accordingly tends to move outward toward the peritoneum or inward toward the uterine cavity. In case the surrounding resistance is uniform it naturally maintains its intramural position. *Pari passu* with the out-

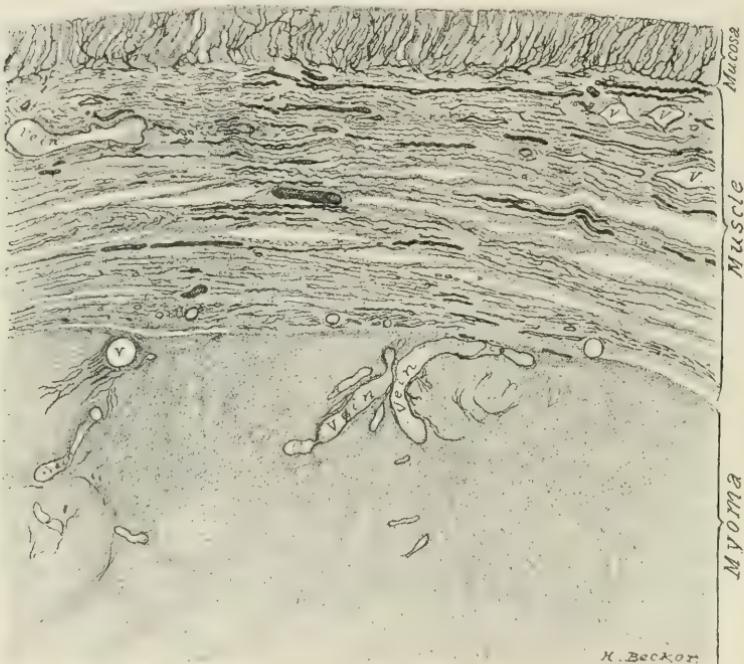
ward mobilization of the tumor, the tendency to a disturbance of the circulation, sufficient to create menstrual disorders, decreases. Even when the tumor remains as a simple interstitial growth, no subjective symptoms relative to the menses are, as a rule, noted. There are, however, some instances where, notwithstanding the fact that the tumor does not encroach upon the mucosa, the menstrual flow may be increased or prolonged, but never to the extent of becoming irregular and profuse. This condition may be explained upon a mechanical basis. In the quiescent state of the uterus during the intermenstrual period the vascular system around the interstitial tumor is only partially filled; but let this same system become distended to turgescence under the menstrual influence, and it goes without saying that the force exerted by the congested and contracting uterine walls against the more or less dense fibromuscular tumor, which remains practically unchanged in its resistance, will retard the exit flow from the deeper veins lying in proximity to the uterine mucosa. As a result of this venous stasis, increased extravasation or diapedesis of blood occurs into the uterine cavity. If there is a multinodular conglomeration of tumors the crowding together of these resistant bodies may also tend very greatly to inhibit the recurrent flow between them, producing even a greater internal congestion than in the first instance.

Here, just as in other tissues, the arteries, on account of the greater thickness of their elastic walls and their constant pulsation, tend to overcome the surrounding pressure and maintain their patulous condition, whereas the veins, which are in many instances little less than flaccid venous channels, are subject to compression upon the resistant tumors. A simple mechanical reproduction of this condition may be made by grasping in the palm of the hand a hard ball over which is placed a soft rubber tube with water flowing through it. A light pressure, sufficient to retain the ball in the hand, will not retard the flow through the tube, but a stronger grasp at once partially or completely checks the flow. In the application of this mechanical principle to cases of myomata two sets of tubes coursing over the hard ball represented by the tumor must be considered, one of which, the arteries, as already stated, are elastic and pulsating, while the other, the veins, are mere passive channels. In the increasing congestion of the uterus incident to the menstrual cycle the arteries tend to resist the surrounding pressure and maintain their flow, whereas the veins may become compressed against the tumor, and, as a result, a venous stasis in the deeper-lying tissue of the uterus occurs, with a consequent increase and prolongation of the menstrual flux (Fig. 58).

With the passing of the menstrual cycle the arteries return to a passive condition, when the veins again become sufficiently patulous to transmit

the blood to the large efferent trunks, and the metrostaxis ceases, only to be renewed again in the succeeding period as a prolonged but otherwise normal flow. To prevent misconception as to the frequency of this occurrence, I would especially emphasize the clinical fact that in the many cases of interstitial and subperitoneal tumors, even increased menstruation does not occur, which is explained no doubt upon the ground of a compensatory vascular adaptability.

FIG. 58.

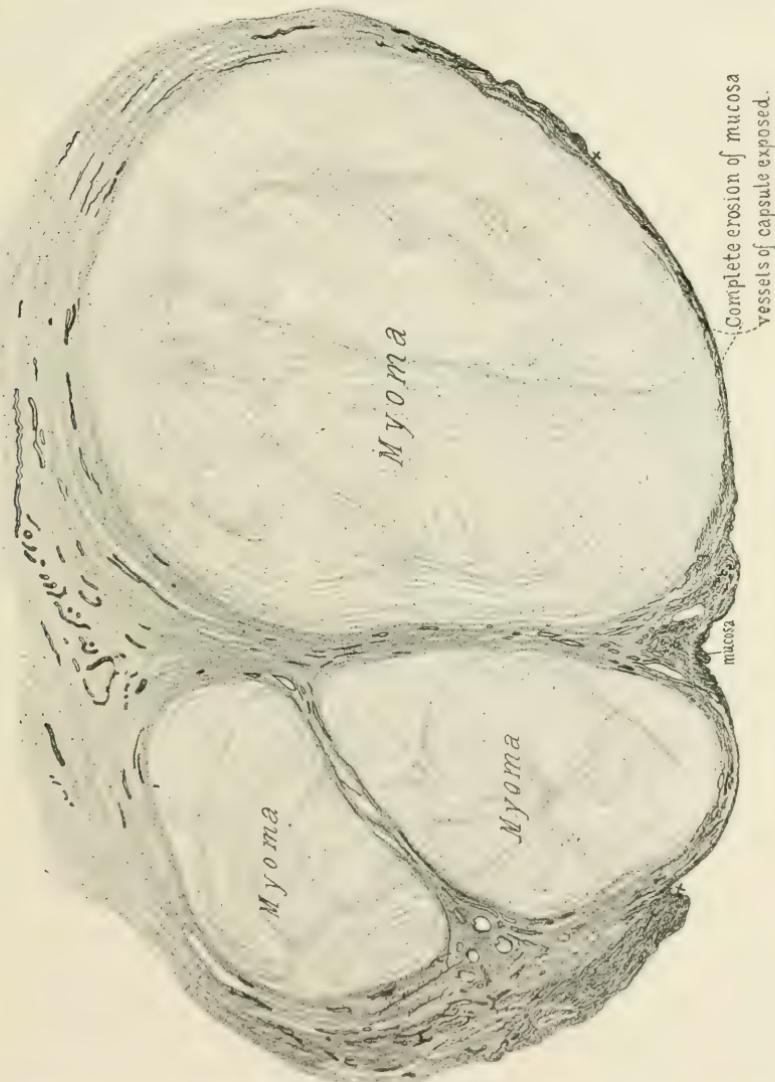


Injected specimen of interstitial myoma, showing derangement of vascular scheme. The perpendicular vessels noted in the normal scheme have here assumed a parallel course through the encroachment of the myomatous tumor. The endometrial twigs, instead of being merely the straight terminals of the perpendicular branches, are here given off at right angles. During the menstrual congestion these twigs naturally become more congested, through purely mechanical conditions, than in the normal state, consequently an increased diapedesis occurs. The large venous channels upon the surface of the myoma, to which attention has been called in the text, are also well shown. (CLARK, *The Johns Hopkins Hospital Bulletin*, 1899.)

While the bloodvessels in close proximity to the tumor may partially be blocked, the anastomoses within the uterus are so perfect as to leave patulous many other equally easy avenues of escape for the venous blood. Therefore, even a decided increase, without further derangement in the menstrual flow, is nearer an exception than a rule unless there is some impingement of the interstitial tumor upon the endometrium.

With the encroachment, however, of the tumor upon the uterine cavity, a second and most weighty cause for the hemorrhages comes into

FIG. 59.



The uterine wall containing three interstitial myomata, two of which have so far encroached upon the uterine cavity as to cause almost complete erosion over the larger and considerable atrophy of the mucosa over the smaller tumor. The mucosa in the depression between the tumors is greatly thickened, edematous, and congested. Limit of mucosa indicated on either side by \times . In this instance, the influx of blood being only slightly impeded, and the reflux very greatly retarded by the crowding together of the three tumors, the hemorrhage was excessive and irregular. The mucosa over the large tumor was so far eroded as to leave the wreath of vessels around the tumor exposed and subject to rupture either through simple pathological or traumatic influences. (CLARK, *The Johns Hopkins Hospital Bulletin*, 1899.)

action. As depicted in the normal scheme of the uterine circulation, the vessels which supply the endometrium reach this point by penetrating the inner muscular coat of the uterus, where they freely anastomose with each other and finally terminate as delicate twigs surrounding the glands of the mucosa. Until this scheme is very much deranged or disorganized by the advancing myoma usually no serious disturbance in the menses, as stated above, will occur. When the tumor reaches the mucosa, however, the menses tend to become free and prolonged, due to a thinning of the mucosa and a coincident degeneration of the vessels, which renders the usual diapedesis much easier or gives rise to an escape of blood through actual rupture of the capillaries. According to the histological observations of Cullen, the vessels of the endometrium are very resistant, and in the earlier stages of encroachment of the tumor the increased flow occurs by diapedesis rather than by actual rupture. At first only the terminal twigs of the endometrium are involved, but later, as the tumor advances and the tension is increased, the mucosa, through gradual erosion, assumes a white, glazed, parchment-like appearance, showing the deeper-lying vessels of the capsule of the myoma.

At this stage the mucosa may be said to have disappeared from the dome-like prominence of the tumor; but further back toward the base where the tension is less and the process of erosion has not occurred, a vascular halo, formed by the vessels of the mucosa, is usually seen. Often a cup-like depression is made by the advancing tumor in the opposite uterine wall, in which one finds the vessels exposed in a similar way. From this endometrial zone I have seen occur, in some of my injection experiments, the most active oozing. In the further expulsion of the tumor the vessels undergo actual necrosis along with the tumor, which renders them brittle and more liable to hemorrhage through extensive ruptures.

The occurrence of large, irregular intermenstrual hemorrhages may be taken, therefore, as an almost invariable indication of the development of a more or less extensive submucous tumor. When the tumor has reached the point where its overlying mucosa has entirely disappeared, the hemorrhage may become wellnigh constant, appearing as a continuous oozing, which is especially aggravated during the menstrual epoch (Fig. 59.)

Should the case be allowed to follow its own course without operative intervention, the tumor may be expelled completely with subsequent restoration of the patient to health, or it may become the seat of an infection which terminates the patient's life; or, finally, through the profound anæmia produced by the hemorrhage, death may occur either through exhaustion or from a terminal infection.

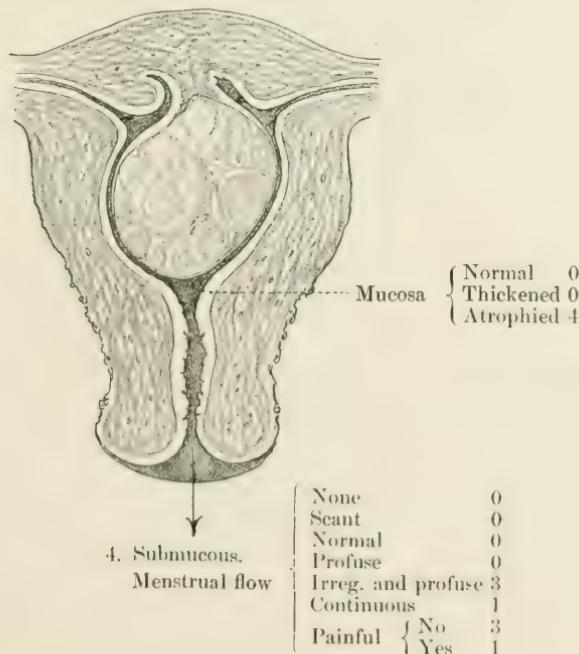
Analysis of the Clinical and Pathological Records of One Hundred Cases. In order to verify and further sustain the conclusions

drawn from my experimental study, to ascertain whether there are frequent or wide variations from them, I have analyzed as closely as possible the clinical and pathological reports of 100 other cases. Excepting those atypical cases of myoma, such as the adenomyoma diffusum benignum (Cullen) and those in which there is a coincident infection from ordinary pyogenic organisms, or from tubercle bacilli, or where there exists a coincident association with carcinoma, I have found a surprisingly small variation. The results of the analysis of 100 cases have been embodied in the form of schematized drawings.

Of the 100 cases those which conform to the simple types of tumors (subperitoneal, interstitial, and submucous) were first classified, but as these comprise only about one-third of the total number, the remainder, showing combinations of the three, have been placed under the two following headings: Combined interstitial and subperitoneal and combined interstitial and submucous tumors. In the latter group several cases have also presented subperitoneal tumors, but as they practically play no part in the production of hemorrhage they are all grouped under the one heading. (See Figs. 60 to 64.)

Figs. 60 to 64.—SCHEMATIC DRAWINGS REPRESENTING THE FREQUENCY OF HEMORRHAGE IN THE VARIOUS TYPES OF MYOMA UTERI (100 CASES). (CLARK, *The Johns Hopkins Hospital Bulletin*.)

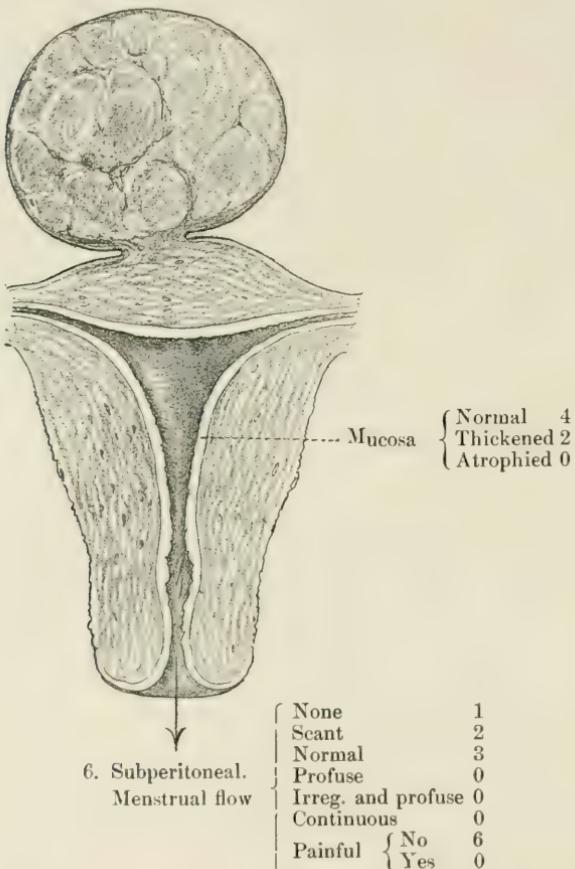
FIG. 60.



This analysis shows beyond doubt that the clinical statement concerning hemorrhage in myoma uteri made by some authors is based upon accurate observations.

Dudley,¹ of Chicago, has stated this in a concise and clear way as follows: "The degree of hemorrhage depends upon the location of the tumors relative to the endometrium and the peritoneum.

FIG. 61.



"The closer its relations to the uterine mucosa the greater the hemorrhage; the nearer to the peritoneum the less the hemorrhage; hence, menorrhagia is almost invariable with the submucous variety, less severe but very common with the intramural, and usually slight or absent with the subperitoneal.

"The pedunculated submucous and the pedunculated subperitoneal

¹ Diseases of Women, 1898.

FIG. 62.

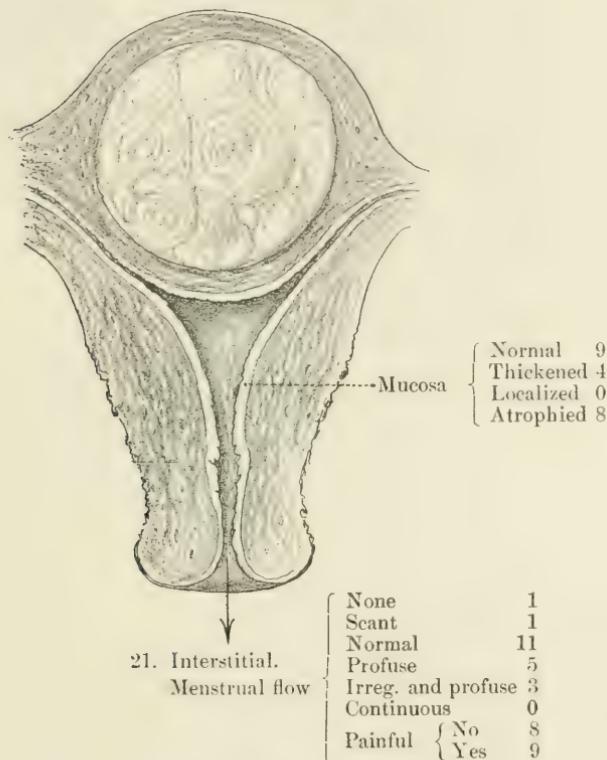


FIG. 63.

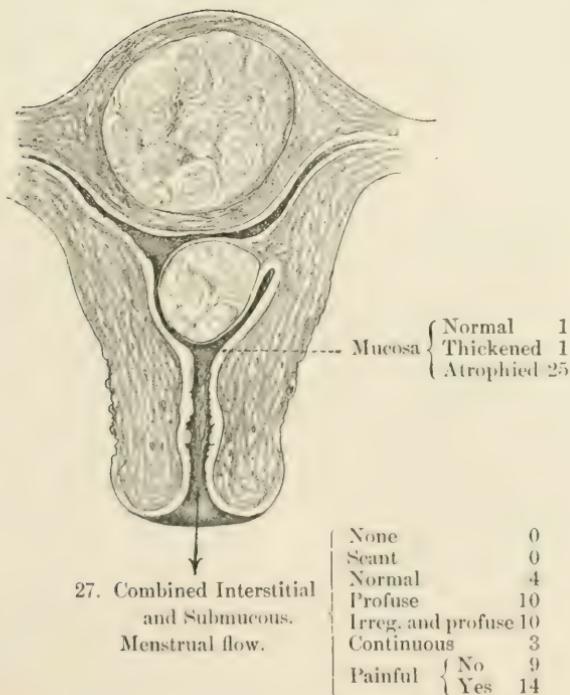
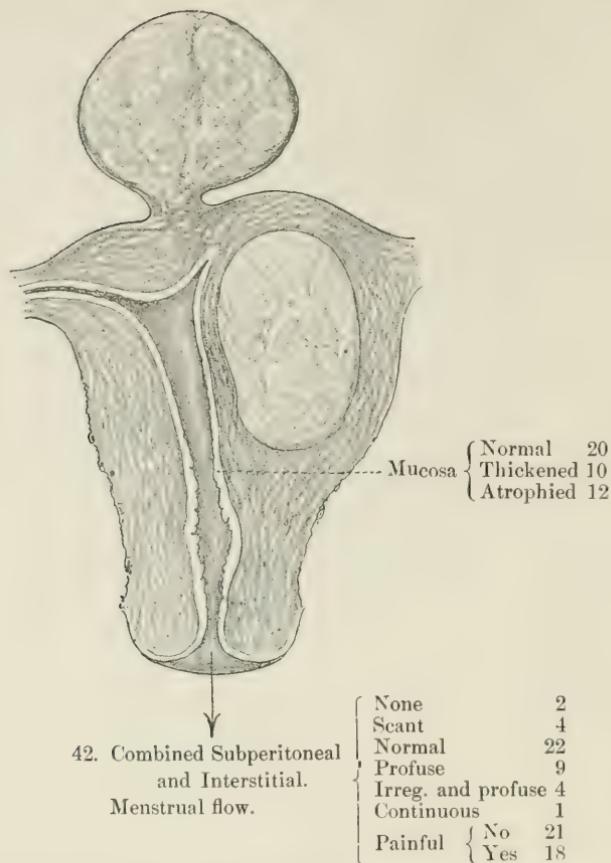


FIG. 64.



myomata stand at the two extremes, the former producing the greater hemorrhage, the latter none at all."

The Surgical Aspect of this Study. The simple diagnosis of a myomatous tumor of the uterus with a subsequent hysterectomy is no longer a difficult matter, but the careful exclusion of the large number of cases from the great general class which, until the last two or three years, have been subjected to wholesale extirpation of the uterus, is a matter requiring accurate discrimination and good surgical judgment. Besides the superior judgment required for the selection of these cases, higher operative measures are brought into play, for it certainly requires more skill to remove the many tumors which one so often finds studding over the surface of the uterus, distending its walls or projecting into its cavity, and to repair through a plastic operation the resultant defects, than to perform a simple hysterectomy. The immediate results and splendid progress of these cases subsequent to operation are the strongest arguments in favor of conservatism.

The removal of either ovaries or uterus in young women, in the majority of whom the maternal instincts are more or less strongly implanted, is one of the most serious surgical procedures, and always to be avoided when possible, not because of the direct influence exercised by the presence of these organs on the womanly characteristics, but because of the depressing mental influence which follows in some instances the realization by the patient that she is sterile, and will remain so to the end of her life. To say, therefore, that a simple or multiple myomectomy with the preservation of the ovaries and tubes is a great improvement over total hysterosalpingo-oophorectomy is not a subject for argument. It is a self-evident truth based upon the principle of preservation rather than that of sacrifice, which in the end leads to a restoration rather than an abrogation of function. I feel assured, when the combined statistics of the best surgeons of the world have been brought together after the general adoption of these revived principles, that those on conservative myomectomy will present a much more gratifying result than those on total hysterectomy.

THE PRODUCTION OF STERILITY THROUGH EXCISION OR LIGATION OF THE FALLOPIAN TUBES.

In all cases in which Cæsarean section is performed the question of how best to prevent subsequent pregnancies arises. Where the Porro operation is performed and the ovaries, tubes, and uterus are totally removed, this question, of course, is permanently settled.

In the last few years, since the improved Sänger Cæsarean section has come into more general use, the problem of how to produce artificial sterility has been actively pressed for solution. It was quite natural at first to assume that the simple ligation of the Fallopian tube would prevent conception; but this proved to be elusive, for the cases of Kehrer, Fritsch and others, in which pregnancy occurred after this preventive operation, demonstrated that the patulousity of one or both tubes had been re-established.

In a recent study by Fraenkel¹ thirty-three experimental operations were performed upon rabbits, and notwithstanding the very careful ligation, complete severing and excision of portions of the Fallopian tube and horns of the uterus, the lumen of the organ was frequently re-established; thus in the total number of experiments (thirty-three) only twice was an absolute atresia produced.

In his microscopic study of these cases after ligation, Fraenkel found that even immediately after the ligation of the tube it was not

¹ Archiv. für Gynäkologie, 1899, vol. Iviii.

absolutely closed, for the lumen of the tube was not constricted concentrically, but was pressed together in a more or less irregular way, frequently dividing it into two lumina instead of one. While the calibre of the canal was unquestionably narrowed or thus divided into two tubes, it was still permeable to ova and spermatozoa. In those cases in which there was atresia the musculature of the tube was first affected, followed by thinning of the mucous membrane. In some instances the epithelium of the tube completely disappeared, and at length only a small atrophic connective tissue area remained. In those cases where the horn of the uterus was ligated, atrophy of the mucous membrane and the glands usually occurred first, followed by the other tissues.

In some cases where the tube was simply ligated, atresia occurred; in others where the tube was not only ligated, but was cauterized, the canal still remained patent.

In fourteen of the thirty-three attempts to induce artificial atresia of the tube the canal remained patent. In twenty-nine cases where the horn of the uterus was ligated it also remained open in twelve cases.

In one of the most interesting cases of Fraenkel's series, in which at least one-half inch of the tube was excised, it was found ninety days afterward that the divided ends had grown together and that the tube was intact.

In another case he cauterized the interior of the Fallopian tube for at least 1 cm. in length. In the opposite cornu of the uterus he cut with the cautery an opening into the lumen of the tube, but did not completely divide it; in another place he cut the tube completely through and very thoroughly cauterized it, therefore the horn of the uterus was divided into three portions on the left side and on the right side into two; notwithstanding this mutilation the divided portions were completely united and the patency of the tube restored.

The experimental research of Fraenkel was carried out with a view of determining the best method of rendering the Fallopian tube of the rabbit impermeable alike for ova and sperma, or, in other words, to set up an effectual artificial barrier for the purpose of preventing the union of the spermatic particle and ovum.

In his remarks upon this subject Fraenkel quite correctly says that to render the animal absolutely sterile it is essential to produce a complete atresia of the uterine end of the tube. Thus, for instance, where the tube is cut through, if the ovarian end only becomes occluded, conception is almost as likely to occur as if no operation had been performed, for the ova may be wafted by the peritoneal fluid into the canal in the uterine stump, or, as is perhaps more frequently the case, spermatozoa wander out through this tube and may give rise to an extra-uterine pregnancy in the occluded end of the ovarian portion of the tube.

Thus it will be seen that the operation of simple ligation is not free of ultimate danger, for sterility may not be produced, and, what is still worse, extra-uterine pregnancy may subsequently occur.

A very interesting observation has been made in Fraenkel's cases concerning the production of hydrosalpinx. He finds that, although hydrosalpinx is formed as the result of the ligation of the tube, the canal in a certain proportion of cases may still remain permeable to ova and spermatozoa. Thus the presence of even a considerable sized hydrosalpinx does not preclude the possibility of pregnancy. Although a perfect closure of the Fallopian tube may occur as the result of ligation, in the course of time the ligature may be thrown off, as demonstrated by Fraenkel, and the tube again become fully patent.

In his experimental ligation of the uterus Fraenkel obtained no better results, so far as the permanent closure of the canal was concerned, than in the Fallopian tube.

In his summary the question naturally arises as to whether these experimental results obtained in the rabbit can be relied upon in the consideration of the artificial sterilization of women through similar operative means. The results, however, in the ligation of the tube may be the same as shown by the cases of Fritsch and Arendt, in which pregnancy subsequent to the ligation of the Fallopian tubes occurred.

In addition to Fraenkel's research numerous observations have been made in cases in which the Fallopian tubes have been removed in various diseases, and an opportunity was subsequently given for the study of the supposedly occluded uterine stump.

Ries¹ has reported three cases in which operations were performed for the removal of the uterine stump of the tube, which was giving rise to trouble subsequent to the primary operation. On serial section of these specimens he found in every case the remaining portion of the Fallopian tube patent and opening into the abdominal cavity. In two similar cases Fraenkel has also verified this result. In all cases the tube was greatly atrophied and the mucous membrane was markedly thinned, but was undoubtedly permeable to spermatozoa.

At this point Fraenkel calls attention to a very interesting possibility ; he claims that through this restoration of the Fallopian tube various micro-organisms may continue to wander from the uterus out into the peritoneal cavity, and thus keep up more or less continuous irritation. Upon this ground it is possible to explain the occurrence of inflammatory exudates subsequent to the removal of the tubes. For this reason Fraenkel advises in all cases where the tube is removed that the mucous membrane and musculature of the tube should be sutured separately and

¹ American Journal of Obstetrics, January, 1898.

then enveloped with peritoneum. Ries suggests that the entire cornual portion of the tube shall be removed by a wedge-shaped incision, after which it shall be carefully closed by deep-buried and superficial peritoneal sutures; only in this way is it possible to certainly render a woman sterile when the ovaries are left behind.

As a result of his experimental studies, associated with the practical experiences noted in similar instances in women, Fraenkel insists that the only certain method of preventing pregnancy is the total removal of the tube by a wedge-shaped incision from the uterus and the exact suturing of the peritoneum over it. In addition to this the broad ligament should likewise be sutured most carefully, so as to prevent the possible infection of the intraligamentary cellular tissue.

Kossman, in a series of similar experiments upon hens, found that sterility was not produced, for in several instances the fowls upon which he experimented continued to lay eggs. Experiments by numerous other investigators concerning the production of hydrosalpinx and pyosalpinx have given more or less confirmatory evidence in favor of the conclusions which Fraenkel has reached in his experimental work.

This article of Fraenkel's is of the greatest service for many reasons, and among others because it proves beyond doubt that there is a strong tendency to restoration of the patulousity of the tubes, even after the most careful ligation, cauterization, and even the excision of portions of it.

At the present time, as I have already stated, the tendency is to perform the simple Cæsarean rather than the Porro operation. Unless some operative procedure is invoked at the time of the simple Cæsarean section the patient will certainly again become pregnant, and will have to undergo a second, or, as in one or two instances, even a third Cæsarean section. If, for instance, the Cæsarean section is performed for great contraction of the pelvis, which offers insuperable barriers to the birth of a child, it is highly essential to protect her against the dangers of subsequent pregnancy by some operative measure. Of course, the removal of the ovaries will effectually do this; but such a measure must by all means be avoided, for it is not necessary, and, therefore, if performed is unjustifiable.

Through these experiments of Fraenkel, it appears certain that sterility may permanently be induced by total excision of the Fallopian tube down into the uterine cornu. Under these circumstances the menstrual function will be maintained, and none of those distressing nervous and psychic phenomena noted in cases of removal of the ovaries will occur.

Incidentally, it is worthy of remark at this point that a series of experiments such as those carried out by Fraenkel are of the greatest

service to surgery and to humanity in general. The statement is constantly made by antivivisectionists that good results are never obtained through experimental work upon animals ; here, however, we have a perfect demonstration of the fallacy of this position.

For some time I have felt it highly essential in all cases where it was necessary to remove the Fallopian tubes for purulent accumulations to at the same time excise the cornual end of the tube, for I have noted as post-operative sequelæ localized abscesses and inflammatory exudates at the site of the ligated tube where the cornu has not at the same time been excised.

The suggestion as to operative methods by Ries in inflammatory cases, and by Fraenkel in cases where sterility is to be produced, should meet with hearty approval.

OPERATIONS DURING PREGNANCY.

In an article by Noble,¹ he reviews the histories of all cases operated upon by him during pregnancy, and arrives at the practical conclusion that all ovarian tumors should be promptly removed, even quite late in pregnancy, for the risks of operation are much less than the risks of delay.

The chief danger is that the tumor may be bruised through the traumatism of labor, and subsequently the patient may suffer from more or less severe peritonitis. If the tumor is discovered during labor Noble believes that it should be removed immediately after, in order to prevent the possibility of peritonitis.

With regard to fibroid tumors, he does not believe that they should be removed during pregnancy, unless there is some urgent indication, on account of the dangers of abortion. The only variety of fibroid tumor which he believes should be removed is the cervical or one situated very low in the pelvis which may be approached through the vagina. The operation should only be performed in the later months of pregnancy, so that in case labor is induced it will do no harm, for a full-term child will be born.

In all purulent inflammatory conditions involving the genital tract which are amenable to operative treatment there should be no hesitation as to the course to pursue, for the risks of operation are far less than those of parturition through an infected genital canal. With reference to general operations in other parts of the body, Noble believes that there should be strong evidence that the patient's life or health is seriously jeopardized before resorting to surgical interference. Under these

¹ American Gynecological and Obstetrical Journal, 1899.

circumstances operations should unhesitatingly be performed, for the risks of abortion are not great.

This applies especially to such diseases as appendicitis and cancer, which threaten life immediately or remotely.

In addition to these general conditions Noble also refers especially to the operative treatment of hemorrhoids, in which he runs counter to the usual teaching, in that he claims that it is better to operate upon these cases than to run the risks of possible sloughing of the hemorrhoids during or subsequent to labor. He therefore does not hesitate to remove large, painful hemorrhoids during the last month of pregnancy, so that the wound will be healed before the advent of labor.

Noble's position relative to operations during pregnancy is well taken, with the possible exception of operation for hemorrhoids, and even in this condition I am not certain but that I fully agree with him as to the advisability of the radical relief of this condition. When patients are suffering excessively from the presence of inflamed hemorrhoids I do not believe that operation is contraindicated. Advice, however, as to this class of operations should be given most cautiously, and only in cases where the patients are suffering excessively should this plan be adopted. By the use of medicated suppositories, cold or hot applications to the external hemorrhoids, and other palliative measures, the patient may be relieved sufficiently to go to full term, after which the hemorrhoids frequently disappear spontaneously.

KRAUROSIS VULVÆ.

From a clinical stand-point all cases in which there is excessive itching with inflammation of the external genital organs, especially of the vulva, have in the past been classified under the term of *pruritus vulvæ*. The first one to call attention, however, to a type which is at first attended by the symptoms of *pruritus*, but terminates in a very different pathological condition, was Breisky, who, in 1885, described twelve cases of this peculiar skin affection under the name of *kraurosis vulva*. Several cases have been reported since Breisky's publication, and recently Williams and Baldy have reported another in which the clinical and pathological aspects are minutely dwelt upon.

The symptoms of this disease are carefully detailed by these writers, and first consist of intense and more or less progressive itching and burning of the vulva. "In some cases the affected tissue is excessively hyperplastic, and dyspareunia develops early. The skin is frequently discolored and small red spots appear on the surface. Some time after these symptoms are noticed the peculiar shrinking of the superficial tissue of the vulva begins to take place. The skin becomes dry and

whitened and often covered with a rough and thick epidermis. The disease may be unilateral or circumscribed, but usually the tissues of the labia majora, the nymphæ, the area about the clitoris and urinary meatus all become more or less involved, while the skin about the anus is frequently affected. As the disease advances the small labia gradually disappear, fusing with the labia majora, and the skin becomes shiny and drawn smoothly over the swollen clitoris, which has apparently retracted behind the skin and is now only indicated by a small depression instead of a prominence. Underlying vessels are frequently seen through the transparent epidermis, and cracks appear on the dry surface, which extend often into the corium. A sensation of dragging and shrinking of the vulva is usually experienced, and the vaginal orifice becomes gradually narrow and more and more contracted. When this condition has been reached the pathological process is arrested, the subjective sensation of shrinking passes away, and the symptoms of pruritus, usually prominent only in the early stages of the disease, are no longer experienced, but the shrunken and contracted vaginal orifice still persists and is never spontaneously restored."

After a very full review of the literature Williams and Baldy come to the conclusion that the cause of kraurosis vulvæ is entirely a local one. They agree with the hypothesis of Veit, that the primary itching induces scratching, which in turn sets up a chronic inflammatory condition with the formation of cicatricial tissue in the deeper layers of the derma and subcutaneous strata, shrinkage and contraction of the vulva, and atrophy of the skin surfaces. Although these cases practically all start with the symptoms of pruritus, nevertheless only a very few true cases of pruritus terminate in this special pathological condition.

These writers believe that the micro-organisms of the skin may be rubbed into the tissues through scratching, and thus a low-grade inflammation is set up, which extends into the corium and underlying subcutaneous tissue. These tissues then become sclerotic and undergo hyaline change, losing their elasticity, and finally shrinking. In this atrophic process the bloodvessels are pressed upon, gradually lessened, and finally destroyed, while the nerve-filaments are rendered first hyperesthetic, and then undergo degeneration. The primary hyperesthesia which has resulted from the irritation gradually gives way to atrophy until the entire thickness of the skin above the areas of scarred tissue is involved.

When this atrophic process is finally completed the disease remains stationary and no further symptoms are manifested. The atrophic process involves all the glands and appendages of the skin, so that the dry, glossy surface, dead-white appearance, and tendency to crack are readily accounted for.

Treatment. As stated by Williams and Baldy, local treatment of any sort is of no avail when the final stage of the disease is reached, and the only possibility of relieving the patient is through the removal of the atrophic skin and scar tissue and its replacement by flaps of healthy skin and mucous membrane. For the relief of the subjective symptoms, carbolic acid and cocaine afford temporary relief, but the symptoms return, after the employment of these remedies, with renewed severity.

Tait has employed a solution of neutral acetate of lead in glycerin, placed on a pledget of cotton between the nymphæ. Johnstone advises a salve of yellow oxide of mercury in the early stages.

Among the other remedies, silver nitrate and hot water have been employed for temporary relief. Heitzmann has employed curettage, but without satisfactory results, for it requires frequent repetition, and the treatment is, therefore, a long and painful one. Martin has suggested the complete excision of the diseased tissue, applying this method in five cases, four of which were permanently cured, but in the fifth there was a recurrence.

From this brief review Williams and Baldy arrive at the conclusion that the most certain and effective method of treating these cases is thorough excision of the atrophic area.

In all cases usually diagnosed as pruritus vulvæ very careful attention should be directed to the possibility of it being a true kraurosis, such as is described by Williams and Baldy. I am certain that when gynecologists as well as the general practitioner get a clear clinical and pathological picture of this disease many cases which have hitherto been classified under the general title of pruritus will be transferred to his new classification.

Personally, I recall among several cases of pruritus which have been seen within the last four or five years a few which were most likely true cases of kraurosis vulvæ. Two of these cases were of many years' standing and were completely relieved by an operative procedure similar to that employed in the foregoing cases.

Great care should be exercised in the selection of these cases for operation, for the simple cases of pruritus may usually be healed by appropriate local and systemic remedies. We know that frequently the simple cases of pruritus which may give rise to excessive irritation and itching are mere symptoms of some generally depraved systemic condition, such as diabetes, etc. Under these circumstances it would be manifestly poor surgical judgment to submit the patient to an operation for a local symptom which is due to a general cause.

According to these writers' description, I take it that the cases to be submitted to operation are those in which the skin surfaces no longer

present the appearance of acute inflammation, but are dry, atrophic, and sealy in appearance. Certainly, there is no class of patients who are more grateful for relief than these, for there is no symptom which is more distressing than the excessive burning and itching from which they complain in the early stages and the excessive contraction of the vaginal orifice in the later stages of the disease.

THE OCCURRENCE OF STREPTOCOCCUS PYOGENES IN GYNECOLOGICAL DISEASES.

Clinically we look upon the streptococcus pyogenes as the most fatal organism which may invade a wound during an operation or give rise to the disease for which the operation is performed.

As yet our ideas are somewhat vague as to the virulence of the organism, and the varying conditions and the frequency of its occurrence are also not well determined. Any literature based upon close observation and bacteriological control of these cases is, therefore, a distinct advance, and adds to our ability to forecast the probable course of a case in which this organism is present at the time of operation.

In presenting, under the above title, the careful bacteriological review of 127 inflammatory cases which have been subjected to a thorough bacteriological control, G. B. Miller¹ has made a very valuable contribution to the literature of this subject.

Among these 127 cases the following inflammatory conditions were found :

1. Pelvic abscesses and exudates.
2. Cases of pelvic peritonitis with encysted fluid.
3. Cases of sactosalpinx (pyosalpinx and hydrosalpinx).
4. Ovarian abscesses.
5. Suppurating cysts and infected myomata. (Cases of appendicitis or general peritonitis following this condition, peritonitis following operation, kidney, gall-bladder, and urinary bladder cases are not considered in this paper.)

Streptococci were found only seven times in these 127 cases. Of these, six dated the onset of the illness to a miscarriage or a full-term labor. The only exception was in a case of myoma uteri, in which there was an associated infection. In one case hysterosalpingo-oophorectomy was performed; in three cases vaginal puncture; in one incision and drainage of pus sac above Poupart's ligament; one drainage through central incision, and in one hysteromyomotomy (death on the operating-table). With the exception of the last case all of the remaining recovered.

¹ American Journal of Obstetrics, 1899.

After giving the essential details of each case, Miller makes a most satisfactory review of many interesting phases of this subject, which cannot fail to appeal strongly to all operators who are dealing with pelvic inflammatory diseases, and I quote, therefore, very liberally from his paper.

The first question considered is, "How often is the streptococcus pyogenes encountered in gynecological operations?" Concerning this point he says that satisfactory statistics are difficult to obtain, inasmuch as few writers have furnished results of bacteriological examination, although statistics confined to cases of pyosalpinx and hydrosalpinx are not uncommon. He has collected 620 cases from the statistics of Zweifel, Menge, Witte, Prochownik, Hartman and Morax, Martin and Wertheim, all of which except 69 were instances of pyosalpinx or of acute salpingitis; and of the whole 620 in only 36, or about 6 per cent., was the streptococcus proved to be the infecting agent. In the 127 cases of inflammatory conditions of the pelvic organs personally studied by Miller the streptococcus was found in 7 instances, or 5.5 per cent., so that his figures nearly correspond with those of the authors just quoted.

It is apparent from these figures that the streptococcus is comparatively rarely met with at gynecological operations. Nevertheless, it is encountered sufficiently often to be worthy of serious consideration, and the next question which arises in Miller's mind is, "In what class of cases is it encountered?" Of the seven cases given in his article, four were undoubtedly of puerperal origin, and were classed as instances of puerperal parametritis. In Case II. the striking sign on palpation was the bony hardness of the mass filling the posterior and both lateral portions of the pelvis, and which was found to contain only a small quantity of pus. The tubes and ovaries were not seen, and it cannot be stated whether they were involved or not. In Case III. the mass filled the left side of the pelvis in the broad ligament, extended to the posterior pelvis, and filled the loose connective tissue between the uterus and bladder, pushing the uterus into retroversion. It was likewise of bony hardness and contained only 125 c.c. of pus. The tubes and ovaries were not seen. In Case V. there was an exudate of bony hardness in both broad ligaments, containing only three ounces of pus. The left ovary and right tube and ovary were not involved, but the omentum and intestines were adherent. In Case VI. the posterior and both lateral segments of the pelvis were filled with dense indurated tissue, and the mass extended several centimetres above the symphysis pubis. Only a little seropurulent fluid was found on puncture through the vagina. In Case IV. there was doubt as to whether the infection had originated from the puerperal uterus or from the vermiform appendix. The history favored the former view. The mass extended from below the uterine cornu to

the height of the umbilicus in the right side. The mass consisted of small pockets of pus in dense indurated tissue. Both ovaries and the left tube were free. In Case I. the mass differed in nature from those just described. Here there was a definitely localized pelvic abscess occupying the cul-de-sac of Douglas. The streptococcus pyogenes was found along with other bacteria, as in Case VII., where the infection occurred in a necrotic submucous myoma. In the other five cases it was found alone.

Although nearly every trustworthy investigator has found the streptococcus in cases of pyosalpinx, Miller is convinced that in cases of pyosalpinx proper this organism is but rarely encountered, for in not one of such cases has he found the streptococcus. On the other hand, in the cases of dense pelvic exudates or parametritis, with little or no pus, or pus in pockets scattered throughout hard, indurated tissue, and in which the tubes and ovaries are not usually involved, Miller confidently expects to find the streptococcus. In many of these cases the tube on one or perhaps both sides may take part secondarily in the process, and doubtless many of the cases classed as pyosalpinx fall in this class. Here, of course, the micro-organism will be found in the tube also. According to Miller, we may also look to encounter the streptococcus in such conditions as prevailed in Case VII., where there was a submucous myoma undergoing necrosis, with necrotic masses of tumor and decomposing blood in the uterus, cervix, and vagina. In puerperal infections with the lesions described above Miller believes that we may assume with a great degree of certainty that the micro-organism causing the infection is the streptococcus. Of course, he does not attribute every puerperal infection to this bacterium. The gonococcus, the staphylococcus aureus and albus, the colon bacillus, and many other bacteria have been found in puerperal uteri, but they certainly do not, as a rule, cause the lesions described.

As to the POINT OF ENTRANCE AND MANNER OF THE INFECTION, Miller claims that most of the cases of inflammatory diseases of the female genital organs, in which the streptococcus is the infecting micro-organism, occur in the puerperium; that the streptococcal puerperal infection is nothing more or less than a wound infection is definitely settled. Hence, the micro-organism may gain entrance through any portion of the genital tract where there is an abrasion of the surface, be it in the vulva, vagina, or uterus. Bumm, Widal, and Krönig believe that the place of predilection for the entrance of the infecting bacteria is the site of the placenta; other authors, as Von Winckel, Fritsch, Spiegelberg, and Birch-Hirschfeld, think that the primary site of infection is to be looked for in the cervix or portions of the genitalia other than the cavity of the corpus uteri. It seems also well established

that while the micro-organisms are generally carried in on the hands of the nurse or the doctor, or on instruments, they may also gain entrance by direct extension from the surface of the body. According to Miller, in rare cases, perhaps, in which there is an old localized streptococcus infection, this may be lighted up by the labor producing raw areas and bruised or necrotic tissue.

In inflammatory cases in which the original lesion has been produced by some other micro-organism, and in which there have been adhesions to or rupture into the intestines, a direct invasion of the streptococcus from the intestinal canal is possible. Menge has recently emphasized the fact that in cases of submucous sloughing myomata, carcinomata, or necrotic polypi, with dead nutrient material, such as blood-clot or necrotic masses in the genital tract, the streptococcus may gain entrance without the aid of external agents by direct extension from the surface of the body. In some cases operations upon the genital tract may have been the cause of the localized streptococcus infection which is met with at a subsequent operation. This class included abortions instrumentally produced. Finally, as rare cases, Miller says one meets with localized lesions in the genital tract produced by the streptococcus, which has gained entrance into the general circulation at some other point. In such cases the patient has previously had a streptococcal sore-throat or an erysipelas or other local infection; the microbe has seemed to select a ruptured corpus luteum or a poorly nourished myoma or cyst as the point of least resistance, and has there produced the lesion which the gynecologist encounters. In Miller's cases four were undoubtedly of puerperal origin; one (Case I.) was probably an extension from the intestinal tract, and in the remaining one (Case VII.) the micro-organism undoubtedly entered through the vagina, and had found in the cervical canal and in the uterine cavity conditions favorable for its growth and extension. The necrotic myoma was thus invaded, and through it there was finally a systematic infection.

In considering the ROUTE OF INVASION, Miller refers to three cases of Bumm's in which there was lymphatic infection. The streptococcus was demonstrated by cultures. Bumm found the lymph-channels, especially those under the placental site, filled with streptococci. The patients all died of purulent peritonitis, and although he could not follow the bacteria directly through the lymph-channels to the peritoneum, he thought it was by extension through these paths that the peritonitis occurred. In one of his cases a venous thrombus also contained cocci. Miller also describes two cases in which the streptococci had followed thrombi in the uterine veins to the peritoneal surface of the uterus. Widal reports twelve cases, in eleven of which bacteria were found in lymph-channels. He often found also the bacteria in bloodvessels. He

thought the lymph-channels were the route preferred, but also found the micro-organisms generally in the bloodvessels either of the uterus or of other organs of the body. Krönig reports three instructive cases. Of Miller's seven cases six recovered; in the seventh no careful histological study was made of the myomatous uterus.

From the work of the authors above quoted Miller concludes that there can be little doubt that the streptococcus gains entrance into the human organism by way of both lymph- and blood-channels, preferably by the former. It may, perhaps, enter the peritoneal cavity by way of the Fallopian tubes, but he thinks this seldom occurs.

Miller believes that certain lesions are found which may be regarded as characteristic of the streptococci. He describes these lesions as follows: where the micro-organism follows those lymphatics or thrombosed veins which lead to the peritoneal covering of the uterus or pelvic viscera it invades the peritoneal cavity, causes acute peritonitis, and generally death. A chronic general peritonitis is, perhaps, never due to the streptococcus pyogenes. Where the circulating blood is invaded there ensues a general infection of the whole organism. When the lymphatics or thrombosed vessels leading into the tissues surrounding the uterus are the routes of invasion we have the lesions which the gynecologist oftenest encounters. These lesions were seen in five of Miller's seven cases. There is at first a softish, elastic swelling, which, as absorption goes on, becomes harder, so that it frequently at last has a bony consistence. Often there occurs pus formation, usually in the form of small abscess cavities scattered throughout the mass. As it follows the parametrial connective tissue, the exudate may have various positions in regard to the uterus. It seems generally to lie in the posterior and lateral regions, but it may lie anteriorly, antero-laterally, or posteriorly, or it may fill the whole pelvis, taking in the rectum and vagina in its extension. Again, pushing the layers of the broad ligament upward, it may form a large tumor mass extending into the abdominal cavity, or, by extending in the retroperitoneal tissues, it may form a tumor lying on the posterior, lateral, or anterior abdominal wall, not usually extending above the umbilicus or across the median line. In other cases it may cause tumors of the false pelvis. It may include the upper part of the vagina in its extension. It may displace the bladder from its normal position, giving rise to urinary symptoms, or so constrict the lumen of the intestine as to cause almost a total obstruction of the bowel.

In reaching a diagnosis Miller says the most important points are the history of the case, the intimate connection of the tumor to the uterus and the neighboring organs, the immobile condition of the uterus, and the bony hardness of the mass which is usually found when the patient enters the gynecological clinic. He is not prepared to state that the

lesions above noted are never caused by any other bacteria, but he believes that the streptococcus is certainly the exciting agent in by far the large majority of such cases. In the 127 cases examined by him it was the only micro-organism found when the lesions were such as described above.

Concerning the length of life of the streptococcus in the human body, Miller states that the streptococcus may live in the human organism for months and perhaps for years. As it can be cultivated without the least difficulty in these cases, it can be regarded as capable of infecting other persons. In this way the streptococcus shows characteristics markedly different from those of the gonococcus, which lives a comparatively short time in the pus cavities which it forms, although apparently almost indefinitely in mucous surfaces.

In considering the PROGNOSIS as to the life of the patient, and also the possibility of childbearing, Miller says that only one of his patients died, and this was a case of general streptococcal infection, the woman succumbing under operation. "The others were discharged from the hospital in a much improved condition in from two to eight weeks after operation. Only three of the six have since been heard from. None have been pregnant. Two are much better and feel well, and the third is worse; from her account it may be conjectured that suppuration is still going on in the pelvis." In four of the six patients who recovered the peritoneal cavity was invaded at the time of the operation, but in only one of these did symptoms of peritonitis develop. The symptoms in this case subsided in from forty-eight to seventy-two hours, and the patient recovered rapidly and was discharged "wonderfully improved" in two weeks.

Miller calls attention to the clinical fact that when virulent streptococci, even in minute quantities, are introduced into the peritoneal cavity, most patients quickly succumb to peritonitis. This leads him to attempt an explanation of why his six patients recovered so rapidly and showed no grave signs of peritonitis. One answer is that the bacteria were not of the most intense virulence, and the second is that the patients were, to a certain extent, immune. In considering the first supposition Miller says that in a large majority of cases where there is a streptococcus endometritis following labor the patients recover, frequently without signs of transport of the micro-organism elsewhere. In these cases he assumes that the fight between the human organism and the bacteria ends favorably for the former. As is well known, the virulence of the streptococcus is notoriously uncertain in animal inoculation, and we know by clinical experience that an infection which proves rapidly fatal in a woman suffering from carcinoma, Bright's disease, etc., would, in a strong, healthy individual, be comparatively harmless. Miller believes that it is impossible to state positively that in these cases the bacteria

were without virulence. It is possible, according to him, that by a long residence in the individual they had to a certain extent grown harmless. With regard to the second supposition, that the patients were to a certain extent immune, Miller recalls the fact that by injecting small quantities of streptococci repeatedly in susceptible animals the animals finally become to a large degree immune to this micro-organism. This is probably due both to the toxins produced and to the increased number of leucocytes in the blood called forth by such injections. Both of the above conditions—*i. e.*, the diminution in virulence of the micro-organism and the partial immunity—may, according to this writer, have operated to protect the peritoneal cavities of the four women from the ravages of the streptococcus.

Treatment. Miller offers the following advice: “As the exudate begins usually in the true pelvis it should, when possible, be approached from the vagina and the peritoneal cavity should not be invaded. Of course, where the diagnosis is not certain an exploratory laparotomy is often necessary. Where it is impossible to reach the mass from the vagina the incision should be made at the point where it lies in contact with the abdominal wall. Incision or puncture, with a free opening up of the mass with the fingers or by blunt dissection followed by free drainage, is always indicated. In Case VI. there was no pus, but by this method of treatment the mass quickly decreased in size, and the patient was discharged, greatly improved, in two weeks. Excision of the tubes, ovaries, or uterus is rarely indicated. Where the uterine appendages are removed for a streptococcal parametritis, that more harm is done than good is self-evident.”

It is to be noted that the logical premises which Miller has laid down in his consideration of the treatment are certainly well grounded by his careful, scientific, and practical study of these cases. From personal experience I can indorse every word he has said. By following the plan of treatment—by vaginal puncture—extirpation of the uterus and tubes in puerperal cases will frequently be avoided. Certainly, the fact that of these seven cases only one died, and that not a puerperal case, is a telling argument in favor of this much less radical plan of treatment. By all means the vaginal puncture should first be tried, and if this fails more radical measures may be adopted.

The low mortality in these cases is a revelation to me, for I have long considered the streptococcus such a lethal organism as to kill the majority of surgical cases in which it occurs in the active state at the time of operation. Certainly, the extensive abdominal operations which have been and are still performed by some surgeons for these pelvic puerperal conditions cannot be attended with the same freedom from danger shown by this method of treatment.

MOVABLE KIDNEY IN WOMEN.

As the field of gynecological and abdominal surgery in general has widened during the last few years it has been found that there are a number of surgical diseases of the kidney which are so intimately linked with the diseases of the pelvic organs as to render their accurate study very necessary to the gynecologist.

The provision of nature by which the ureter, in its course from the brim of the pelvis to the bladder, is preserved from disease is remarkable. This fact is constantly impressed upon me in the examination of patients suffering from extensive inflammatory disease of the uterine adnexa. In the close association of the ureters at the base of the broad ligaments with the parametrial connective tissue it would seem impossible for extensive or even minor disease of this area to occur without involving the ureter.

In this special review, however, it is not my intention to consider the secondary diseases of the kidneys which arise from pelvic involvement of the ureters, but to review, somewhat briefly, the more recent literature on movable kidney.

For several years not only movable kidney, but also the widely floating kidney, have usually been relegated to the domain of the physician, who has used temporizing measures for holding the kidneys in their proper positions, and has given symptomatic treatment. Of late, however, there has been a wide-spread tendency, exactly as there was a decade ago with regard to appendicitis, to transfer this condition from the physician to the surgeon, and we find, therefore, that the surgical literature bearing upon the treatment of these cases has increased very extensively during the last few years.

I know of no more persistent and distressing train of symptoms attending any condition than is presented by these patients, some of whom are semi-invalids for years, and who continue, regardless of any plan of treatment, in a more or less miserable state of health.

A number of very good original articles and a splendid summary of the recent literature (*Frommel's Jahresbericht*, 1899) which has been written upon this subject are before me. Becher and Lennhoff¹ have recently gone rather extensively into the study of the etiology of movable kidney, and in order to determine how much the wearing of corsets has to do with this condition they studied twenty-four young native Samoan women who had never worn any sort of constricting bands about the chest or waist. Of these women there were six in whom the right kidney was palpable, which caused these authors to conclude that the factors

¹ Körperform und Lage der Niere, Deutsche med. Wochenschrift, Bd. xxiv., p. 508.

leading to the production of movable kidney are quite independent of the constriction attributable to the wearing of corsets and to the suspension of heavy skirts about the waists. In considering the palpability of the kidney these writers state that in a stout woman with a short, broad thorax and round dome-like abdomen the normal kidneys are not palpable, while in a slender woman of delicate stature with long, slender chest and long, flattened, relaxed abdomen the kidneys may always be felt. As the result of an extended study of a large number of patients they have arrived at the conclusion that under physiological conditions palpation of the normal kidney depends entirely upon the figure of the woman. Under certain circumstances, where there is even excessive mobility of the kidney, the condition is very difficult to determine.

Along this same line Keller¹ states that congenital movable kidneys very seldom occur, but that this condition is usually an acquired one. The increased mobility of the kidney occurs primarily from relaxation of the actual supports of the kidney, and secondarily from the decrease of the general intra-abdominal pressure, which is most marked after confinement, and is further increased by the respiratory movements of the diaphragm and the dragging incident to the weight of the kidney itself. The extirpation of large tumors may also act in a similar way, causing marked relaxation of the abdominal walls, which leads to a sagging down of the kidneys. As general causes for this condition may be named rapid emaciation from the effects of acute infectious diseases and from such chronic pathological processes as tuberculosis, carcinoma, and inflammatory affections. Prolongation of the lactation period may also lead to similar results.

The view advanced by Knapp, that the change in the position of the kidney is induced by the tugging upon the ureters by an enlarged, pregnant uterus is disputed by Keller. Malposition of the uterus and movable kidneys are frequently coincident, and are dependent for their production upon the same general causes. Menstruation is not an etiological factor in the production of movable kidney, although the reflex symptoms incident to this condition may distinctly be exaggerated during the menstrual flow. The subjective symptoms, coincident in many instances with this condition, are distinctly attributable to disease of the genital organs, and under these circumstances pathognomonic symptoms of the movable kidney are not present. The only absolutely reliable sign is the exact bimanual palpation of the movable kidney. The close association of the kidney, liver, and gall-bladder on the right side sometimes renders a differential diagnosis between diseases of these organs exceedingly difficult. In one instance which I recall I saw most expert

¹ *Monatschrift für Geb. und Gynäkologie*, vol. vii.

diagnostician mistake a movable lobe of the liver for a movable kidney. Unless the greatest care is observed in the differentiation of symptoms in these cases such mistakes may occur.

With regard to the treatment, Keller suggests as prophylactic measures the careful regulation of the puerperal state, the horizontal dorsal posture being especially advised. Above all things insisted upon by this writer is the use of close-fitting abdominal binders. Special renal pads, according to him, are not necessary. The use of the binder may be supplemented by cold baths, electricity, and massage of the abdominal wall. A special diet for the purpose of meeting various symptoms should also be prescribed. If there is no distinct improvement from this line of treatment the only remaining resort is to suture the offending organ to the posterior abdominal wall.

Schäffer especially insists upon the dietetic treatment of these cases for the purpose of increasing the muscular tone as well as replacing the normal fat.

As a further etiological factor, Holländer claims that scoliosis plays a prominent part in these cases, and with Keller does not believe that the dislocation of the kidney ever occurs from the tugging on the ureters by a pregnant uterus.

Olshausen states that movable kidneys are most frequently produced by early pregnancy and the relaxation of the abdominal muscles, and attributes the more frequent descent of the right kidney to the action of the superimposed liver.

Lewis¹ maintains that undue mobility of the kidneys is due to the disappearance of the perirenal fat. He also believes that traumatism, repeated pregnancies, increase in the size of the liver, constriction of the waist, and the extirpation of large abdominal tumors are etiological factors. He is opposed to the views of Glénard, who believes that all cases of movable kidney are simply one part of a general enteroptosis, because he has found numerous instances of movable kidney without any tendency to this general sagging of the other abdominal organs. As do the foregoing writers, so Lewis believes that the abdominal binder can only limit the mobility of the kidneys and temporarily relieve symptoms; the only curative measure, according to him, is nephrorrhaphy.

With regard to the question of the frequency of movable kidney, Suckling² finds that a large proportion of women suffer with this condition; of 100 women whom he examined he found it in 42 cases. As a control he examined 100 men, and only found movable kidney in 6 cases. As movable kidneys he classifies all those which may be felt beneath the ribs and which glide outward underneath the palpatting hand. As car-

¹ New York Medical Journal, vol. lxvii.

² Edinburgh Medical Journal, vol. xlvi., p. 228.

dinal symptoms he names pain and uncomfortable feeling in the region of the kidney, especially on standing, sitting, and walking; mental distress, merging at times into melancholia; dizziness, dyspepsia, palpitation of the heart, slight traces of albuminuria, swelling of the spleen, colicky pains, and general debility. As etiological factors he believes that corsets, falls, lifting of heavy weights, and excessive vomiting are to be taken into account. In the way of treatment he employs a binder, with a specially arranged renal pad, and believes that a resort to surgical treatment is but seldom necessary.

Holleederer,¹ in considering what is and what is not movable kidney, claims that there is a normal physiological mobility accompanying the diaphragmatic respiratory movements. When, however, this range of mobility is palpable he considers it abnormal and terms it "respiratory mobility." He describes a still greater range of mobility as that in which the kidney may be grasped, dislocated in one direction or another, and then replaced in its normal position. The highest degree of mobility is that in which the kidney may be pushed into almost all parts of the abdominal cavity. This is known under the distinctive name of the "wandering kidney."

As to etiology, Holleederer does not believe that there is ever a congenital mobility, for he has examined forty children from one to six years of age, and in no case has this condition existed. In ten girls past thirteen years of age he has found mobility of the kidney in five instances (four right and one left). On the contrary, among five boys of the same age he did not discover a single case. The greater frequency of mobility of the right kidney he attributes to the constricting influence upon the liver of waist-bands, but agrees with Fischer that the corset does not play a very active part in its production, for women are frequently found who have never worn a corset and yet suffer from this dislocation.

In those cases in which considerable pain accompanies the movable kidney Edebohls believes that it is attributable to a coincident chronic appendicitis. The latter condition, according to this writer, is dependent upon the movable kidney, and as a ground for this theory he says that the displaced kidney makes pressure against the head of the pancreas, and in this way the superior mesenteric vein is compressed, which in turn causes congestion of the colon and vermiform appendix, and on account of the narrowness of the appendix a chronic appendicitis arises. In a large number of cases examined by Edebohls in which nephropexy was performed there was a spontaneous healing of the appendicitis (twelve times in fifty-eight cases).

¹ Ueber bewegliche Nieren im Kindesalter. Inaug. Diss., Erlangen, 1897.

Appendicitis occurs, according to him, in from 80 to 90 per cent. of movable kidney cases, and the spontaneous healing of the appendicitis after the suture of the kidney is only to be anticipated when the mobility of the kidney is not of long standing. In chronic cases, to insure the relief of the symptoms, the vermiform appendix also should be removed at the same operation. Edebohls has had five such cases in which the most satisfactory results were obtained by this plan. This writer should be an authority on this subject, for his latest report included 107 cases, in which 135 kidneys were sutured.

Cleveland¹ attributes the production of seven cases of movable kidney to traumatic causes—four times to heavy lifting and three times to falls. The chief symptoms observed in his cases consisted of dragging sensations in the sides and digestive disorders, and in only one case were severe nervous symptoms present. In one case there was a coincident enteroptosis, prolapsus uteri, and cystocele. All of these patients were treated by bandages, and in one case there was a permanent healing, as shown by the fact that after the removal of the bandage the kidney remained in its proper position; in all of these cases, however, it is to be noted that the patients were seen immediately after the accident which caused the dislocation of the kidney. In two instances the use of the bandage did not relieve the patient, and Cleveland thinks in time it will be necessary to resort to nephorrhaphy.

Lichty² attributes the production of movable kidney less to the influence of pregnancy than to deficient general nutrition. He classifies the symptoms as follows: kidney symptoms, pressure symptoms, and reflex symptoms. If the kidney itself is not diseased the therapy must be directed to the improvement of the general nutrition. For the relief of the movable kidney he likewise employs bandages, and when these prove valueless advises nephorrhaphy.

With regard to the frequency of enteroptosis and movable kidney, Langerhaus³ found that in 100 cases of the latter there were 47 cases of the former, and according to his observations there is always gastrop-tosis accompanying movable kidney; in only five cases was one isolated without the other.

Genouville⁴ has reported two cases in which the symptoms of movable kidney were present, but in which not the kidney but the liver was movable. In both cases the symptoms disappeared after suspension of the liver.

Fredelet⁵ gives a splendid description of a case in which the vessels

¹ New York Medical Record, vol. lxxi.

² Philadelphia Medical Journal, 1898.

³ Clinica chir., No. 5.

⁴ Annales des Maladies des Organes Gen. Urin., tome xvi.

⁵ Ibid., p. 1300.

were injected and the organ fixed in its dislocated position. In this case the kidney was movable and slightly dropped. According to this observer the intermittent hydronephrosis in these cases is due to torsion of the ureters.

Treatment of Movable Kidney. A very unique case is reported by Cragin¹ of an eight and one-half months' pregnant woman who had passed through two previous confinements. When Cragin saw her the pelvis was greatly narrowed by a tumor lying in front of the sacrum.

A diagnostic puncture was made through the posterior cul-de-sac, which showed that the tumor was a congenital kidney, in which hydronephrosis had taken place. As the quantity and quality of the urine voided from the bladder were normal, Cragin concluded that the other kidney was normal, and therefore decided to remove the displaced organ by the vagina.

After clamping the pedicle a ligature was thrown securely about it, and the kidney was excised. This is, without doubt, the first case of vaginal nephorrhaphy, and is likely to stand as a unique case for some time. The day following the operation a strong, healthy child was born, and uncomplicated convalescence followed. The treatment employed by Cragin in this case appears to have been very judicious, for the kidney, as already indicated, was hydronephrotic, and its incarceration within the pelvis the shortness of the ureter and the abnormal origin of the vessels would have precluded the possibility of replacing it to its normal position in the loin.

In the discussion before the American Gynecological Society, Kelly, Gordon, Dudley, Harris, Bovée, Noble, and Mundé reported similar cases of congenital displacement of the kidney into the pelvis.

Bidwell² analyzes the symptoms of movable kidney and describes the various methods of treatment. According to him, fixation of the kidney is unavoidable in certain cases, especially when the less radical methods have been tried without benefit. This is especially indicated where the symptoms are severe and where, on account of the sensitiveness of the kidney, bandages cannot be borne. Of the various methods of operation he prefers the method of Vulliet—suture of the kidney to the aponeurosis of the longissimus dorsi muscle.

Barrow³ has reported two cases of nephorrhaphy, in the first of which the kidney had been suspended one year previously. After the first operation the patient was free from symptoms for a while, but they again returned with their former severity, and at the second operation it was found that the upper pole of the kidney was adherent, but that

¹ American Journal of Obstetrics, vol. xxxviii.

² London Lancet, 1898.

³ Ibid.

the under pole had broken away and was hanging pendulous by the scar tissue. The adhesions were separated and the kidney again fixed in its proper position with three sutures. After the second operation all pain and symptoms disappeared, and the patient was entirely relieved. In the second case, besides the pain and other symptoms in the right lumbar region, the patient also suffered with frequent nocturnal micturition. In this case, likewise, all symptoms disappeared after nephrorrhaphy.

Becker¹ describes a very interesting case of displaced kidney, in which the kidney pressed upon the duodenum and gave rise to sufficient obstruction to cause dilatation of the stomach, with all of its attendant symptoms. The signs of constriction of the duodenum, so characteristic of the presence of tumor in this region, led to the diagnosis of a tumor of the pylorus, and the diagnosis was only corrected after an abdominal incision had been made. The wound was closed and a lumbar incision was made, through which the kidney was stitched back into its proper place. Notwithstanding several complications which arose in the course of the convalescence, the patient finally made a complete recovery. The kidney remained fixed in its proper position, and although the gastric symptoms did not entirely disappear, they were, nevertheless, greatly relieved.

Bernhard² reports a case of displaced right kidney, accompanied with severe attacks of pain. On making the lumbar incision for the purpose of suspending the kidney it was found that this organ was not so movable as was anticipated, but that it was overlapped by a lobe of the liver. In this case the fibrous capsule of the kidney was incised and stripped back slightly and united to the lumbo-dorsal muscle. In order to produce as much scar tissue as possible the skin wound was left open. In addition to the fixation of the kidney the movable lobe of the liver was also fixed by suture. The attacks of pain disappeared immediately after the operation and had not returned nineteen months afterward. In this case Bernhard notes that the patient had never worn corsets.

Harvie³ cites sixteen cases of nephorrhaphy performed for movable kidney. In three of these cases a kinking of the ureter occurred on account of the marked descensus of the kidney when the patient was in an upright posture, which gave rise to a damming back of the urine in the pelvis of the kidney. In performing nephorrhaphy Harvie makes two parallel incisions in the fibrous capsule of the kidney, one inch long on the dorsal aspect, which he brings in contact with the muscle wound by means of chromicized catgut and silk.

¹ Deutsche medicinische Wochenschrift, Bd. xxiv., p. 11.

² Monatssehr. f. Geb.-Urin. Gyn., Bd. vol. xi., p. 582.

³ Annals of Gynecology and Pediatrics, vol. xi., p. 430.

Montgomery¹ reports a case in which he performed a double nephrorrhaphy and extirpated a cyst from the left kidney at one sitting. Besides this a urethral caruncle was removed and the uterus was curetted, the posterior cervical lip was amputated, and ventrofixation was performed. In this case suppuration of the abdominal wounds occurred and there was marked irritation of the kidneys, but, notwithstanding these complications, the patient made a final complete recovery.

Morris reports fifty-seven cases of nephrorrhaphy, in only one of which was failure noted.

Oelnitz² reports an interesting case of nephrorrhaphy which came, through some intercurrent disease, to autopsy seven months after the operation. In this case the kidney was so securely attached that on traction the renal tissue was torn before the scar tissue.

Reed³ describes a special method of nephrorrhaphy. He exposes the kidney by the usual lumbar incision, and after displacing the intestines passes three silk or catgut, kangaroo tendon, or silkworm-gut ligatures by means of a needle six inches in length, through the cortical substance of the kidney, and then through the muscular wall and the skin of the lumbar region between the eleventh and twelfth ribs. These sutures are tied over a tampon of gauze. The sutures are removed after ten to fourteen days.

Tuflie⁴ has reported seventy-two cases of nephrorrhaphy, in all of which the employment of the bandage had failed to give relief. In all of the cases the immediate results were good, although in twenty cases after some little time there was again a return of the renal pain. In a series of seventy-two cases two died, one of tetanus and one of pneumonia.

Weir and Foote⁵ have reported six cases of movable kidney, with seven nephrorrhaphies (double nephrorrhaphy in one case). In these cases the fibrous capsule of the kidney was dissected away, and the wound was left open in order that the scar tissue might form on the site of the granulation process. In only one case was the capsule of the kidney sutured to the fascia. In all the cases the kidney remained permanently fixed, and in the majority the patient was permanently relieved of all discomfort. In every instance the employment of the bandage before the operation had proved fruitless.

Seun⁶ avoids the penetration of the parenchyma of the kidneys with sutures. After making the lumbar incision the perirenal fat of the

¹ American Gynecological and Obstetrical Journal, vol. xii.

² Resultat d'une nephropexie: Bull. de la Soc. Anat. de Paris, Sitzung, vols. xi.-xii., p. 214.

³ Columbus Medical Journal, vol. xix., No. 9.

⁴ Centralblatt f. die Krankheiten d. Harn- u. Sexualorg., Bd. Ix., p. 7.

⁵ Medical News, vol. Ixxii., p. 79.

⁶ Journal of American Medical Association, 1897.

posterior surface of the kidney is removed and the fibrous capsule of the kidney is scarified, after which strips of iodoformized gauze are packed down to the scarified area and in front of the kidney. The wound is also tamponaded and left open. The patient is kept in the dorsal posture for a few days, after which the tampon is removed and the edges of the wound are brought together by means of adhesive plaster and a tight-fitting binder. In this way he avoids the use of sutures and claims to get satisfactory results from the adhesion between the abdominal wall and the surface of the kidney.

By way of experiment Sottocasa¹ has tried a new method of fixing the kidney in dogs. After the exposure of the kidney through a lumbar incision he makes an incision three-quarters of an inch long and one-third of an inch deep, in the upper third of the convex border of the kidney, into which he sutures a small fasciculus of muscle from the quadratus lumborum; in addition a few sutures are passed through the capsule of the kidney and attached to the muscle. Following this the aponeurosis and muscle of the lumbar wound are brought together with catgut sutures and the skin with silk. In those animals killed some time subsequent to the operation it was found that the muscular tissue which had been sutured into the kidney had been transformed into fibrous tissue and formed a firm support for the kidney.

Eccles² has treated twenty-one cases of movable kidney with bandages, massage, and special gymnastic exercises for the strengthening of the abdominal muscles. In sixteen cases the patients were confined to bed in a horizontal position from two to eight weeks, and in only one of these cases was a failure to relieve symptoms noted. Eccles especially advises the employment of remedies which will improve the general condition of the patient. If a satisfactory result is not reached in the relief of the renal symptoms by this means the patient is at least gotten into a very much better condition for a surgical operation. This writer believes that the disturbances of the stomach, liver, and nervous system are unquestionably induced by the abnormal mobility of the kidney.

Eisenhorn³ claims that he has seen no improvement after nephrorrhaphy, and that the symptoms were made worse rather than better. On this ground he discards operative measures and relies upon dietetic and mechanical methods of treatment, especially advising the abdominal bandage.

From this general summary of the treatment of movable kidney two cardinal facts are self-evident:

¹ Nuovo processo de fissazione del rene. *Clinica Chir.*, No. 6; ref. *Centralbl. f. Chir.*, Bd. xxv., p. 1013.

² *Lancet*, 1898, p. 288.

³ *Medical Record*, New York, vol. liv., p. 220.

First. The proper adjustment of an abdominal bandage may in some cases sustain the kidney in its proper position, and thus relieve symptoms.

Second. In case this treatment fails there is still a good chance for cure by means of nephorrhaphy or by other methods of artificial suspension of the kidney. In a considerable proportion of cases of movable kidney, especially if the patient is stout and has a short thorax and prominent abdomen, the binder gives little or no relief. There is also another class of patients in which sufficient pressure to hold the kidney in its proper position gives rise to such uncomfortable symptoms or even severe pain as to preclude the possibility of its use. In the treatment of these cases it is my rule to employ, invariably, the bandage first. If necessary the patient is put to bed for a few days, in order that the kidney may drop back to its normal position, and during this time she is instructed to wear the bandage continuously.

In this way I find that satisfactory results may be obtained in cases that would otherwise continue to suffer. After having tried bandages, dietetic treatment, and possibly massage of the abdominal muscles without improvement of symptoms, I discard all these measures and advise operation. While in the past I have been favorable to the method described by Edebohls—of fixation by means of suture—of late I have been inclined, not so much through personal experience as through literary review, to a method similar to that described by Senn—gauze packing between the surface of the kidney and the abdominal incision. In this way adventitious scar tissue is formed, which acts as a suspensory medium. In some cases I have seen considerable disturbance arise from the introduction of sutures into the pulp of the kidneys, and in one or two instances stitch-hole abscesses have arisen, which have to some extent involved the kidney. In view of this possible complication it seems to me that the method of Senn is preferable, provided its ultimate results are satisfactory. I am so strongly inclined to this method of operation that I shall put it into effect in future cases.

ENDOMETRITIS DOLOROSO.

The classification of the various forms of endometritis is usually made upon a pathological basis. Pain may not be a prominent symptom in simple cases of endometritis, but patients often complain of an excessive discharge, and dysmenorrhœa, which has only become exaggerated late in the course of the endometritis.

Sneguireff,¹ of Moscow, has called attention to a form of endometritis which is especially characterized by excessive pain in the pelvis and

¹ Archiv für Gynäkologie, 1899, vol. lix.

lower abdomen, and by marked nervous disturbances, ranging in severity from simple neurasthenia to hysteria or epilepsy. According to his statement, this is not an infrequent disease, for he has seen thirteen cases in the course of one winter. One of the chief characteristics besides pain is the extreme resistance to curative treatment, for notwithstanding the use of every possible medical, electrical, and hydrotherapeutic measure, the patients frequently continue to complain and drift from one physician to another.

The nearest approach to a recognition of this condition was made by Routh, of London, in 1870, who described the painful form as "fundal endometritis." While Routh differentiated four forms, two of these, at least, are due to associated diseases of the adnexa. The two forms which simulate the form described by Sneguireff were named by Routh "endometritis fundi convulsiva" and "endometritis fundi obstructiva."

Routh believes that the excessive pain emanates from a chronic catarrhal condition of the fundus uteri, and is to be recognized by the introduction of the sound, which produces pain similar to that usually complained of by the patient. In the convulsive form of endometritis the introduction of the sound causes the patient to complain not only of pain, but also of a cramp-like contraction of the uterus. In these cases the fundus is often found by bimanual examination to be excessively sensitive, and is the centre from which the pains emanate. If the inflammatory process be localized at the os internum, a form of stenosis, which is characterized by excessive sensitiveness on contact with the uterine sound, is produced, and, quite naturally, all these symptoms become exaggerated at the menstrual period. With this exception, Sneguireff finds no reference in medical literature to this form of endometritis. On account of the characteristic history of pain in these cases, associated with the nervous disturbances, this writer prefers to use a diagnostic term which applies to the complex of symptoms rather than to the pathological process, and, therefore, introduces the term "endometritis doloroso."

So far as the question of age is concerned, there does not appear to be any distinctive period when it is likely to occur, for his patients ranged in age from twenty-two to forty-six years. The patients were all married, and although seven of the ten had borne children, it had been a long time since the last birth, which leads him to state that the majority of these cases become sterile.

The symptoms which perhaps are most marked of all are the nervous disturbances, such as headache, sleeplessness, tendency to melancholia, excessive nervousness, etc. Through the continuous pain, the absence of beneficial effects from treatment and the great mental depression the patient may be led to contemplate suicide as a relief from her suffering.

The pain is of a boring or tearing character, which is increased by work, walking, defecation, urination, and coitus. All of these symptoms are greatly exaggerated during the menstrual period.

Sneguireff has prepared a diagrammatic chart showing the external points of exit of the pelvic nerves, and claims that pain in these areas is absolutely characteristic of this disease. If one makes digital indentation just above the spine of the pubes, and a finger's breadth above this point, the patient will complain of extreme pain. These, according to Sneguireff, are two characteristic painful points. The third painful point is found on the inner side of the anterior superior space of the ileum, the fourth on the outer border of the ileum, and the fifth on the inner surface of the thigh beneath the inguinal fold. If there is tenderness or pain on pressure at these points we may safely assume that in sounding the uterus the patient will complain of pain, either at the internal os or about the fundus.

In some cases all of the points of exit of these nerves are hypersensitive, whereas in others only one side or only a few of the nerves may be involved. The usual points are those just above the spines of the pubes and on the inner surface of the thigh. Pain may be referred to the hypogastric, renal, and solar plexuses.

If the sound is introduced into the uterus it will usually give severe pain at the internal os, and then again when one or the other angles of the fundus is reached.

Leucorrhœa may or may not be present, and does not constitute a characteristic symptom.

The nerves of the fundus uteri, according to Mein, are in direct connection with the first two cords of the lumbar plexus; under these anatomical conditions the entire clinical picture of endometritis doloroso becomes plain. So far as the etiology is concerned, Sneguireff finds little pathological basis for the symptoms, and says that further observations will be required before this point can be determined. Notwithstanding the fact that these cases have usually been considered extremely persistent and difficult of cure, this writer claims that if proper treatment is instituted all may be made well.

This classification according to symptoms, of Sneguireff's, is at least an interesting one, and possibly may lead on closer observation to the full confirmation of his statements. Of a large number of cases of dysmenorrhœa which are constantly submitted to dilatation and curettage, a considerable proportion show no pathological lesion. When there is a distinct inflammation of the mucosa, as is frequently the case, there is sufficient explanation for the pain and discomfort from which these patients suffer. In all clinics where it is possible to follow closely the history of cases, patients should be carefully examined, with

a view to confirming or disproving the statements made by Sneguireff as to the painful points which he considers pathognomonic of endometritis dolorosa.

Until further observations are made I am not able from my own experience to confirm Sneguireff's statements, but I look upon his article as being an extremely interesting one and an attempt in the right direction of further differentiating the various pains and aches of the menstrual period classified under the term dysmenorrhœa.

Dysmenorrhœa, as we all know, is not a disease, but a symptom which may arise from various local and constitutional affections. To differentiate more closely the various conditions from which this symptom may arise is unquestionably desirable, for we are well aware of the fact that the usual diagnosis of stenosis of the cervix uteri, endometritis, etc., is sometimes more or less haphazard, and by no means gives a satisfactory explanation of the symptoms of which patients frequently complain.

Treatment. As employed by Sneguireff, this consists in the application of leeches over the symphysis pubis and later a very wide dilatation of the cervix and the introduction of a large tamponade, which is left in place one or two days and then replaced by another.

DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE GLANDULAR AND LYMPHATIC SYSTEM.

By ALFRED STENGEL, M.D.

THE year's progress in knowledge of the diseases included in this section has been marked by no one contribution of particular importance nor by a few such. There has, however, been an increased recognition of the importance of the condition of the blood, not alone in the anaemias, but also in various systemic and infectious diseases, while the metabolic diseases and the alterations of metabolism in various forms of disease have occupied a much greater share of attention than has ever before been given them.

THE BLOOD.

Methods of Examination. No great improvement has been made in the methods of examining the blood. A few unimportant modifications of the instruments have been suggested, but none of these is likely to displace the older ones.

The practical recognition of anaemia by physicians is a matter of much importance, for notwithstanding the fact that instruments of precision are very largely employed, and are becoming more and more perfected, the practising physician still relies upon such evidences as pallor, etc., for his diagnosis of the existence of anaemia, and often for his estimate of the degree. Any simple means, therefore, that will give a fairly satisfactory measure is to be welcomed. Some years since Stephen MacKenzie suggested that high grades of anaemia—that is, reduction of haemoglobin below 50 per cent.—could be recognized by the disappearance of the pink color under the finger nails; but in numerous observations I have found this almost as unreliable as judgments based upon the color of the lips or of the skin in general. Krönig¹ refers to a method that was practised by Gerhardt in his wards, and which he himself has found useful. In this method a drop of the patient's blood is allowed to saturate a piece of white filter-paper or a white cloth of some sort, and the color of this is compared with the color of a drop of normal blood of

¹ Eulenburg and Samuel's Lehrbuch der Allg. Therap., etc., 1899.

about the same size. The test may be made quite accurately by using small pieces of white filter-paper, upon which several drops of blood are allowed to flow until an area about 4 to 6 cm. long and about 1 cm. wide is covered. This can be tested with a piece of filter-paper similarly treated with normal blood. I have myself used this method with considerable satisfaction at times when it was inconvenient to have more accurate examinations, and have demonstrated it to students as a useful rough test.

It cannot be too often recalled that all of our clinical methods of examining the blood are at best approximate. This applies to the counting of the number of corpuscles, and especially to the estimation of the percentage of haemoglobin; but, though all of the instruments have greater or less inaccuracies, the comparison of results obtained from time to time with the same instrument gives useful information.

Attention has been repeatedly called to the unreliability of the von Fleischl haemometer as a means of determining the amount of haemoglobin, and it is held by some that a more useful estimate can be obtained by determining the specific gravity of the blood by Hammerschlag's method, or the pyknometer, and comparing the results so obtained with carefully prepared tables showing the relation of specific gravity to percentage of haemoglobin.

Recently, Yarrow and Hitchens¹ have studied this question and have confirmed the results of Schmaltz by preparing a solution of haemoglobin in normal salt solution. By subsequent dilution they obtained solutions of various percentages of haemoglobin, and constructed the following table :

Specific gravity 1030	=	20 per cent.	Specific gravity 1051	=	65 per cent.
" " 1035	=	30 "	" " 1052	=	70 "
" " 1041	=	40 "	" " 1053.5	=	75 "
" " 1042.5	=	45 "	" " 1056	=	80 "
" " 1045.5	=	50 "	" " 1057.5	=	90 "
" " 1048	=	55 "	" " 1059	=	100 "
" " 1049	=	60 "			

They then compared the actual strengths of their solutions with the percentages determined by the von Fleischl apparatus, and obtained the following results :

Standard Solution.	Von Fleischl Haemometer.	Standard Solution.	Von Fleischl Haemometer.
100 per cent.	= 109 per cent.	55 per cent.	= 52 per cent.
90 "	= 100 "	50 "	= 46 "
80 "	= 80 "	45 "	= 40 "
75 "	= 75 "	40 "	= 38 "
70 "	= 69 "	30 "	= 30 "
65 "	= 61 "	20 "	= 20 "
60 "	= 56 "	10 "	= 10 "

¹ University Medical Magazine, October, 1899.

The Gowers instrument gave quite as accurate results in their hands as the von Fleischl apparatus, but the Oliver tintometer was more reliable than either. It has the great disadvantage, however, of being costly. The Henocque haematoscope gave fairly accurate results.

S. Jellinek and F. Schiffer¹ have made a comparison of the specific gravity and the amount of dry residue in the blood, led thereto because it is often stated that there is a direct relation between the specific gravity, the haemoglobin, the amount of dry residue and the volume of corpuscles. The iron was determined by Jolles' ferrometer. In three healthy persons there seemed to be a relation between the dry residue, the iron, and the specific gravity, and in diseased persons there was a relation between the specific gravity and dry residue; but these two seem to bear no direct relation to the amount of iron.

Iron in the Blood-serum. A. Jolles² uses his ferrometer as a means of determining the presence or absence of iron in the blood-serum. A negative result was obtained in eighteen normal persons and in three cases of chlorosis, one of leukaemia, one of neoplasm, and one of interstitial nephritis. Two cases of severe diabetes showed determinable quantities of iron, and traces were found in the serum of two cases of severe anaemia. Jolles believes that the presence of iron in the blood-serum of the diabetic cases may prove to be a matter of importance. I do not believe that dependence can be placed upon these results. In all cases the blood was diluted with an 0.08 per cent. salt solution and then centrifugated. The solution mentioned is certainly not isotonic with the blood of cases of severe anaemia, and probably not with that of the cases of diabetes; at best the results must as yet be considered of doubtful value.

The Eosinophile Granules. Particular attention has very naturally been given to these granules on account of their conspicuousness, and, in addition to the views above referred to, some authors have suggested the likelihood of these being abnormal constituents—substances taken up by the cell or formed by degeneration-processes. Thus Klein,³ in referring to a case of hemorrhagic pleurisy in which the blood at first contained 12 per cent. of eosinophiles and the plural exudate 74.4 per cent. of the same cells, and subsequently the exudate 76 per cent., while the blood contained 40 per cent., suggests that these cells are formed in consequence of hemorrhagic exudation. He regards the eosinophile as a neutrophile that has absorbed haemoglobin. This view is also advanced by E. Fuchs,⁴ who cites as an evidence of this view the occurrence of large numbers of eosinophile leucocytes in sputum in which they had

¹ Wiener klinische Wochenschrift, August 3, 1899.

² Centralblatt für innere Medicin, July 1, 1899.

³ Ibid., January 28 and February 4, 1899.

⁴ Ibid., May 20, 1899.

been scarce before a hemorrhage. He has also found them abundant in hemorrhagic exudates in the serous cavities.

In my own studies of the granules of the leucocytes of sputum I have become convinced that the neutrophilic granules become oxyphilic, and have frequently observed rapid fluctuations in the numbers of such oxyphilic cells. The granules are small and stain quite differently from those of the true eosinophile cell. This subject has been studied by L. Grünwald,¹ who states that he has discovered, in the round-cells of the sputum, pus, sero-purulent exudates, and those of inflammatory tumors, exceedingly small granules which stain with eosin, but which are peculiar in that they are decolorized by acids and alkalies, and, contrary to the eosinophiles, take with the triacid mixture a deep fuchsin red. These were also seen in the blood, but only when the preparations were dried in the air. They were seen best, apparently, when the blood preparations were fixed in 1 per cent. formalin-alcohol, and do not come out well when heat, alcohol, ether or bichloride are used for fixing. Any of these methods of fixing is likely to give them the general appearance of the usual eosinophile granules. Grünwald calls them hypoeosinophiles. They were found in both polymorphonuclear and mononuclear leucocytes, and were most satisfactorily brought out by staining with aleoholic eosin and counter-staining very carefully with methylene-blue. The counter-staining should not be carried too far or they will be decolorized.

It has not seemed to me that the method of fixation alone determined the occurrence of these granules in sputum, but Betmann² holds a contrary view regarding the hypoeosinophile granules of the blood as the result of the method of fixation. He states that he has repeatedly observed that the same blood, when allowed to dry in the air, showed hypoeosinophile granules, while when fixed by Ehrlich's method it showed only neutrophile granules. He also draws attention to the fact that it has been repeatedly noticed that neutrophile granules disappeared in stagnating pus. He thinks that the alterations in these granules are the evidences of degenerative processes, and insists that in drawing conclusions from morphological alterations of the red blood-corpuseles it is absolutely necessary that one should have used, in all instances, the same technique. He believes that Grünwald's technique may be just as good as Ehrlich's, but thinks that we cannot draw very positive conclusions from the results by either method of procedure, since we do not yet know what the various kinds of granules and their alterations mean.

Pathological Changes in the Red Corpuscles. Many observations have been made upon the changes produced by chemical, thermal, and

¹ Centralblatt für innere Medicin, July 29, 1899.

² Ibid., February 3, 1900.

mechanical influences on the red corpuscles. The most elaborate studies in this direction are those of Maragliano and Castellino, who described certain forms of endoglobular degeneration and total necrosis of the corpuscles. In most of these studies, however, the blood was subjected to gross mechanical influences, so that the dividing line between artefacts and degenerations could not be well established. To obviate this objection I¹ studied the changes in the blood-corpuses in the living body under circumstances that were likely to cause degenerations of the cells. In one series of experiments the red corpuscles were taken from the finger after causing extreme congestion with a ligature; in another after freezing the part; in another the blood of animals was subjected to the action of saline solutions within the circulation; blood-corpuses were acted upon by heat, either under cover-glasses or in capillary tubes; and finally heterogeneous corpuscles were introduced into the circulation of animals and studied until their disappearance and the action of the serum of anaemic diseases upon normal corpuscles were observed. I summarized my observations as follows:

"The first stage of degeneration is always a beginning resolution of the vital or chemical combination of the haemoglobin and stroma. This may express itself in slight areas of decolorization or in an earlier and diffuse form, in slight irregularity of contour. Next, the haemoglobin is completely altered and removed, leaving areas of decolorization. In these the haemoglobin may be seen as granular streaks or particles. Occasionally the haemoglobin separates without distinct decolorization of the corpuscles. Complete decolorization, with formation of the shadow corpuscles of Ponfick, is the last stage of this simple form of degeneration. Irregular contractions of the protoplasm may or may not attend this form, but may occur independently; then, however, only as a result of gross insults or by heat. Budding and marked poikilocytosis are the results. A more gradual change may lead to poikilocytes by slow ameboid movements. Microcytes may be split off in either case; while macrocytes are found in some instances, probably as a result of imbibition of liquid.

"Complete or partial fragmentation may result from slight pressure, or other mechanical causes, in a corpuscle somewhat degenerated, though the same causes may leave a normal corpuscle unaffected. Changes of color reaction—the polychromatophilia of Ehrlich and Gabritschewsky—may or may not be seen in degenerated corpuscles. I do not regard it as an essential feature. I do find, however, as did Ehrlich, that it is somehow dependent upon poverty in haemoglobin.

¹ "On the Pathology of the Erythrocyte." Contribution from the William Pepper Laboratory of Clinical Medicine, Philadelphia, 1900.

"All of these changes may occur in corpuscles of anaemic diseases, and indicate some causative influence from without. This, I would urge, from my own experiments and those of Castellino, Gilbert and others, resides in the serum, which is altered by metabolism."

In some of my experimental injections haemoglobinuria was produced. This is a well-known result of serum injections and transfusion of heterogenous blood, as well as of injections of distilled water and various other haemolytic agents. Very similar results were obtained by A. Christomanos,¹ who discusses in particular the fate of the red blood-corpuscles in haemoglobinuria. Haemoglobinuria is produced readily by the injection of glycerin into rabbits. There is first an apparent increase of the red blood-cells, which is followed afterward by an actual diminution of their number, the apparent increase being due to the actual absorption of water by the glycerin. The haemoglobin is abstracted from the red cells very soon after the injection of the glycerin, but the blood-corpuscles do not necessarily disappear at once; they often circulate for a considerable time after having lost the greater part of their haemoglobin until finally they are destroyed by the spleen and bone-marrow. Their final changes are unknown. No changes were found in the liver. The kidneys showed dissolved blood pigment in the tubules when the pigment was excreted in the urine. There is a large amount of water withdrawn from the blood at the same time, and this may become so pronounced that ultimately the tubules of the kidneys may seem to be practically filled with haemoglobin; the dense haemoglobin often forms tube-casts, and the excretion of the urine may be so reduced as almost to amount to anuria. The kidneys become swollen, and there is pain and oedema. The venous congestion may result in the presence of normal red blood-cells in the urine.

Nucleated Red Blood-corpuscles. Haemotologists have been at variance regarding the significance of the existence of one or another form of nucleated red corpuscles and upon the presence or absence of such cells. It is quite certain that the presence of an erythroblast in the circulation is significant of active haematogenesis with sudden extrusion into the circulation of nucleated red cells. The absence of such cells in cases of severe anaemia would, therefore, be an indication of imperfect haemogenesis if it could be shown that nucleated red cells could always escape when the production of red cells is more active than normal and the demand for new erythrocytes is urgent.

J. S. Billings, Jr.,² describes five cases of excessive uremia with absence of erythroblasts, stating that these are the only cases in which the blood-

¹ Virchow's Archiv, Bd. clvi., s. 582.

² New York Medical Journal, May 20, 1899.

count fell below 1,500,000 in which he had not found nucleated red cells. He concludes that the absence of these cells is an indication of faulty haemogenesis.

The Blood-plaques. Investigators have not yet reached a certain conclusion as to the nature of the blood-plaques. All who have studied the effects of destructive agents on the blood-corpuseles have been struck by the resemblance of certain fragmented corpuseles to the plaques, and some are outspoken in their belief that these bodies originate from the red cells. A communication of interest in this connection is that of Determann.¹ He found that the most satisfactory means for preserving the plaques is Bizzozero's fluid. His method of determining their number was as follows: He first pricked the finger and then placed a drop of the preserving fluid over the incision and allowed the blood to flow into it. The cover-glass of a Thoma-Zeiss counter was then attached to this mixture and the drop on the cover-glass thoroughly mixed. The number of blood-plaques and red corpuseles were counted, and the ratio to each other thus established. The actual number of red corpuseles learned from a separate count was then used to determine the true number of blood-plaques. In normal individuals he found the relative proportion varying between 1 to 18 and 1 to 30. In some of the chronic diseases the ratio was sometimes as great as 1 to 1, and in a case of arthritis deformans he found 2 to 1, while in one instance of myelitis they were as 4 to 1. The author believes that the blood-plaques are derivatives of the red corpuseles. He was able to study them by preserving the blood in glass tubes at a temperature of 37°. After twenty-four hours buds appeared on the red corpuseles, which were attached to protoplasmic processes containing haemoglobin, but later separated and were free of haemoglobin. These had the usual appearances of blood-plaques. The budding was very conspicuous in cases of anaemia, and the author believes the blood-plaques are an index of the resisting power of the blood-cells, and thus they become an index of the vitality of the red corpuseles.

The Influence of Iron in Blood Formation. This subject interests the clinician vitally, and is properly discussed under the head of the treatment of anaemia; but it has also important physiological and pathological relations, and is, therefore, referred to in this place. The physiological chemists have waged war over the method and place of absorption of iron and the chemical form in which it is assimilated; but thus far no uniform opinion can be expressed. The practitioner has in the meantime had little doubt that iron is taken up from the gastro-intestinal tract in some form or other, and he is a great deal more certain that it

¹ Deutsche Archiv für klinische Medicin, Band Ixi., II. 4.

is useful in the treatment of anæmia—an opinion in which he is absolutely justified. The various theories regarding the relations of iron to the hydrochloric acid of the stomach and to sulphuretted hydrogen, supposed to be present in excess in anæmia as a consequence of supposititious intestinal putrefaction, are wanting in scientific demonstration. It is also quite likely that iron is not of use as a direct maker of haemoglobin, and the later view that the metal influences haemogenesis by stimulating the blood-making structures, and especially the bone-marrow, is the one which has the greatest plausibility and at the present day the greatest number of adherents. A. Hoffmann¹ has investigated this subject, and at the same time discusses the nature of chlorosis. He carried on experiments relating to the absorption of iron and its behavior after reaching the tissues, with ninety-eight rabbits. He decided that all iron, in whatever form it may be taken, is absorbed in the duodenum, and is then carried by transport cells in combination with albumin in the blood. It is not toxic in this form, and is deposited in the liver and in the spleen, but particularly in the bone-marrow. In the bone-marrow, in his opinion, it stimulates the physiological functions and renders more rapid the transformation of the embryonal form of red cells into the non-nucleated erythrocyte.

The new preparations of iron have no value in his mind over the older, and particularly are preparations of haemoglobin of no special value. The effect of iron depends solely upon the amount absorbed.

W. Wolf² reports some experimental work undertaken to aid in the solution of the question whether iron acts by directly influencing the production of haemoglobin or by exciting the activity of the blood-forming organs. The opinion of to-day is that iron exerts its remarkable activity in chlorosis indirectly by exciting the activity of the bone-marrow and other blood-forming organs. Were this a true view of the action of iron, it seems probable that other substances, particularly salts of other metals, would excite the blood-forming organs to greater activity, and some observers believe that they have seen a marked increase of the red blood-corpuseles after the use of mercury. Some others, Cervello and Barabine in particular, have decided from their experiments that a large number of the heavy metals cause a production of haemoglobin; among these metals they include copper, zinc, manganese, and mercury. They carried out their researches in chickens. Wolf used rats, and gave them finely powdered copper sulphate and zinc, continuing the use of these metals for from forty-one to fifty days. Control animals were observed at the same time. The result

¹ Münchener medicinische Wochenschrift, No. 29, 1899.

² Zeitschrift für physiol. Chemie, Bd. xxvi., p. 442.

was that there was no difference in the weight, in the number of red blood-corpuses, or in the amount of haemoglobin in the two series of animals. Wolf was, therefore, unable to confirm the results of the Italian authors quoted.

O. Jollasse¹ administered iron by the rectum, and found that the citrate given in starch clysters was well absorbed, and apparently acted in the same way as when taken per os. The medication caused some abdominal pain, but no other distress.

Browicz² injected haemoglobin solution under the skin of dogs, and five hours afterward was able to find characteristic crystals of haemoglobin in the liver cells. He was also able to discover bodies within the liver cells which appeared to be erythrocytes and their products.

To the clinician the proofs that iron somehow stimulates bloodmaking are wellnigh conclusive. Instances of post-hemorrhagic anaemia in which there had been no tendency to improvement (as after gastric ulcers) until iron was administered, and in which there has been rapid regeneration of corpuscles and subsequently increase of haemoglobin, are not unusual, and leave little doubt of the stimulating effect of the drug. Unquestionably there are other remedies and physical agencies that exercise a like effect, but the theory of some that iron is useful only in supplying substance for the formation of haemoglobin cannot be maintained.

Recently, F. Aporti³ has stated that for a number of years careful observation in Riva's clinic has shown that in severe anaemias the use of haemoglobin increases only the amount of haemoglobin, while arsenic causes a marked increase in the number of red blood-cells. This fact he believes he has proved experimentally also. He repeatedly abstracted blood from animals and kept them on iron-free food. He found that there was a constant effort at the production of new red blood-cells, and that for a considerable time new haemoglobin was formed, the iron necessarily being obtained from the iron deposits in the organs, chiefly, of course, from the liver. But after a time, if blood was repeatedly abstracted, the iron of the organs was exhausted, no more haemoglobin was formed, and the animal died. That the iron of the tissues of the body was so used he believes he has shown by treating an animal after the manner indicated until it died and then estimating the amount of iron in the various organs. He found the amount in the liver greatly reduced as compared with that in the liver of a normal animal; the quantity in the liver was about the same as the amount in other organs. The iron in all the organs was reduced to a

¹ Münchener medicinische Wochenschrift, No. 37, 1899.

² Bulletin internationale de l'Academie des Sci. de Cracovie, July, 1899.

³ Centralblatt für innere Medicin, January 13, 1900.

very small amount. When animals treated by the abstraction of blood while taking only iron-free food were brought to the point of exhaustion of the tissue-iron, and then given arsenic, there was increase in the number of red blood-cells, but no increase in the haemoglobin. If iron was then given there was an astonishing increase in the amount of haemoglobin; in one case reported the amount advanced from 50 per cent. to 95 per cent. in seven days. Aporti decided that the production of haemoglobin and of red blood-cells depends upon different factors, and that certain substances, particularly iron, increase the haemoglobin, while other substances, especially arsenic, increase the red blood-cells.

The Effect of Exposure to Cold upon the Blood. It has long been held that exposure to excessive cold has a disorganizing effect upon the blood. This view has been applied to the etiology of paroxysmal haemoglobinuria, attacks of which in susceptible individuals have been known to occur after exposure. In my own experiments I have found that freezing the finger causes changes in the red corpuscles which may doubtless be associated with more or less dissolution and liberation of haemoglobin. Actual haemoglobinuria was not, however, demonstrated. Other observers have exposed animals to considerable degrees of cold by immersion in cold water, and have found evidences of corporeal disintegration. Recently, E. Grawitz¹ discusses the results obtained by Reineboth and Kohlhardt in their experiments upon this question. These authors found that there was a marked reduction of the haemoglobin, and haemoglobinæmia occurred, which they attribute to a primary decrease in the haemoglobin of the cells and a subsequent reduction in the number of cells, the results in their experiments being first the production of a chlorotic condition, and then a condition of general anæmia. These results are at variance with those which Grawitz had previously reported. He considers them untrustworthy and due to the fact that the authors mentioned examined blood taken from constricted veins. He has repeated his earlier experiments, which consisted essentially in dropping rabbits into ice-water and examining blood taken from unconstricted veins. He was unable to find any evidence of haemoglobinæmia, either by simple ocular examination or by the spectroscope. There was, in all instances, an increase in the specific gravity of the serum and of the blood, which Grawitz, as in his previous communications, attributes to an exudation of lymph from the capillaries into the tissues. The marked effect of cold baths and of the subsequent use of warm douches is, in Grawitz's belief, largely attributable to this exudation of serum and its subsequent return into the bloodvessels, thus washing the tissues and causing marked alterations in metabolism.

¹ Centralblatt für innere Medicin, November 18, 1899.

Reineboth¹ answers Grawitz's criticism of the work done by Reineboth and Kohlhardt. His chief point is that Grawitz, in his opinion, did not use water sufficiently cold. He also insists that the spectroscopic examination of the serum is not trustworthy, and refers again to the results obtained by himself and Kohlhardt with the haemoglobinometer; these showed a reduction in the haemoglobin. Grawitz² answers Reineboth by stating that he used ice-water in his experiments, that he considers the results obtained by the haemoglobinometer untrustworthy, and that the abstraction of stagnating blood from constricted veins gives results that cannot be accepted.

Influence of the Nervous System on the Blood. General systemic conditions play a part in inducing changes in the blood, and nervous disorders are notoriously attended with more or less anaemia. A study of the conditions of the blood in the functional neuroses is published by Luxenburg.³ This author found the red cells often excessive and the watery contents of the blood normal, though hydraemia is so often believed to exist. A diminished number of leucocytes was frequently observed.

The Blood at Different Ages. A great deal of attention has been given to the study of the blood at different periods of life, and certain marked characteristics of the blood of infants and young children have been discovered. In advancing years these do not seem to change from year to year, though minute studies have not as yet been made.

Schwinge⁴ has estimated the coloring-matter and the corpuscles at different periods of life, and refers to the literature published by others working along the same line. The red corpuscles are excessive at the time of birth and decrease during the first year, after which they remain more or less stationary to the thirtieth or fiftieth year, when there is a second decline. The leucocytes are in greater numbers at birth than subsequently, the proportion decreasing during the period of development and subsequently increasing slightly. The blood-count is lower in corpuscles as well as in haemoglobin in women up to the climacteric, when the conditions are practically the same in the two sexes. The explanation for this smaller amount of haemoglobin and number of corpuscles in women is probably to be found in the proportionally smaller amount of food taken by them. Of course, various other influences play a part.

Coagulation of the Blood. Spangaro⁵ has made some investigations concerning the coagulation of the blood. He found that when the blood of the mammal or the bird was taken directly from the vessels it took a

¹ Centralblatt für innere Medicin, January 20, 1900.

² Ibid.

³ Ibid., May 27, 1899.

⁴ Pflüger's Archiv, Bd. Ixxiii., Heft 7 and 8.

⁵ Riforma Medica, 1899, Nos. 169 and 170.

considerably longer time to coagulate than when it had previously come in contact with the tissues. He also found that if the blood was placed in vessels and a small portion of muscle or other tissue was dropped into it, or if these were rubbed against the wall of the vessel, the blood coagulated much more rapidly than when it was merely placed in clean vessels. The rapidity of retraction of the clot corresponded to the rapidity of the coagulation. The same was true of the separation of the serum. Blood that was taken from the animal without touching the tissues always showed marked changes and diminution of the blood-plates. As the time of coagulation approaches the blood-plates are seen to collect together, and the same may be noticed in regard to the red blood-corpuses. Similar changes are seen much more rapidly in blood that has touched the tissues. No change is seen in the leucocytes after the removal of the blood.

Leucocytosis. INFLUENCE OF CHANGES IN THE CALIBRE OF THE VESSELS AND IN THE BLOOD PRESSURE UPON THE NUMBER OF THE LEUCOCYTES. V. Decastello and Czinner¹ discuss this subject. Their conclusions from their work were that marked excitation of the nerves of sensation causes a decrease in the number of leucocytes in the general mass of the blood, which is produced by reflex contraction of the abdominal vessels and retention of the leucocytes within them. This result does not follow after the splanchnics are cut. Direct excitation of the vasoconstrictors of a limited area, such as the ear, causes a decrease of the leucocytes flowing from that part. The ingestion of substances which cause contraction of the vessels has the same result. They consider that the effect of shock is due to the same cause. Widening of the vessel's lumen and cutting the nerves of the vessels have no influence upon the reduction of the leucocytes. Reduction of the pressure causes a diminution of the leucocytes. The results described reached their maximum after three or four minutes, and the previous condition is once more found after ten to fifteen minutes.

They consider that the high leucocytic count in the blood from the splenic vein which has often been observed is due to the expression of white corpuscles from the spleen by compression of this organ while making the count. The authors found the leucocytes collected in large numbers in the capillaries of the lungs after the injection of substances causing leucopenia, thus confirming the work of Goldscheider and Jacob. The cause of this they cannot state, nor can they explain the occurrence of diminution of the leucocytes after reduction of the blood pressure.

IMPORTANCE OF LEUCOCYTOSIS IN DIAGNOSIS Whatever theories may prevail regarding the essential nature of leucocytosis and the cause

¹ Wiener klinische Wochenschrift, 1899, No. 15.

of the different forms, no doubt can be entertained as to the great value of the leucocytic count in medical and surgical diagnosis. The existence of obscure suppurations and the differentiation of infections having superficial resemblances are not rarely made plain by a blood-count before other symptoms can give a satisfactory solution. Sometimes the blood-count may be made without previous preparation ; at other times the examination must be made under certain circumstances. Thus the occurrence of leucocytosis during the digestion of a proteid meal has for a long time been recognized as a diagnostic sign of considerable value in the diagnosis of gastric affections.

Chantemesse and Rey¹ discuss the condition of the *leucocytes in erysipelas*. They begin their consideration of the question by the statement that the blood from a cold finger contains only about half the number of leucocytes that one finds after warming the finger. This, they believe, is due to the fact that the leucocytes lie along the walls of the vessels in the portion of the current which moves relatively little. Contraction of the vessels causes increased rapidity of the blood flow and drives the stagnant leucocytes on into the larger vessels ; hence, it is always necessary in counting the leucocytes to warm the finger before taking the blood therefrom. When this precaution was observed the authors found that the leucocytosis which occurs in erysipelas was always parallel with the degree of infection, and that the polymorphonuclear elements were affected more than the others.

In a study of *the blood following convulsions*, F. G. Burrows² found leucocytosis the rule. The eight cases studied represented various forms of senile and terminal dementia and other similar conditions. The severity of the attack corresponded directly with the degree of leucocytosis, and the latter condition persisted from three to fifteen hours after the convulsions. The differential count showed a special increase in the polymorphonuclear elements. Myelocytes were found, and in cases of prolonged grave convulsions their number was considerable. The author did not think that the leucocytosis could be wholly explained by the muscular work performed in the convulsions.

Leucocytosis in Influenza and Tuberculosis. V. Blum³ found that the leucocytes were diminished in four out of five cases of influenza and in six out of sixteen cases of tuberculosis. He believes that the reduction in these diseases and in typhoid fever is due to the involvement of the abdominal lymphoid tissues, and suggests that digestion leucocytosis is due to stimulation of these tissues.

¹ *La Presse Médicale*, July 1, 1899.

² *American Journal of the Medical Sciences*, May, 1899.

³ *Wiener klinische Wochenschrift*, April 13, 1899.

EFFECT OF DRUGS UPON THE NUMBER OF LEUCOCYTES. Bohland¹ finds that certain drugs decrease the number of leucocytes and at the same time cause a diminution in uric acid elimination. Tannic acid, ergot, and atropine had such an effect, though not in like degree, and sometimes the reduction in uric acid occurred before that of the leucocytes (ergot). On the other hand, camphoric acid caused a reduction in leucocytes, but had no effect on uric acid. The author regards these experiments as, in a measure, disproofs of Harbaczewski's views regarding the formation of uric acid. This conclusion, however, is not warranted, as the increase or decrease of leucocytes in the circulating blood does not of necessity indicate a greater or less destruction of white corpuscles.

LEUCOCYTOSIS AND URIC ACID EXCRETION. The relation of uric acid excretion to leucocytosis is a matter of great interest that will be referred to later, but it may be briefly considered here. There is little doubt but that leucocytic destruction is the source of most of the uric acid excretion, though the amount of this does not necessarily run parallel with the number of circulating leucocytes.

Melis-Schirru² reports some observations which go to show that uric acid excretion does not run parallel to leucocytosis. He has observed cases in which there was excessive excretion of uric acid with normal leucocyte counts or with reduction of the leucocytes. He has, however, always seen an increase of the uric acid when there was increase of the leucocytes. He believes that the meaning of this is that when there is an increase of the leucocytes there is an alteration in the function of the organs. The increase of the leucocytes and the increase of the uric acid are due to the same cause, but are not absolutely dependent upon each other. For instance, increase of the function of the lymphatic tissues causes a collection of nuclein in them, and further oxidation of these produces the alloxur bodies. It is in this way, he thinks, that the post-digestive leucocytosis and the accompanying increase of uric acid excretion may probably be explained, the digestion causing increased activity of the lymph glands. He likewise considers it possible that repeated or permanent activity of the cause producing the increase in uric acid causes a change in the anatomical structure of the tissues that results in a leucocytosis.

DISEASES OF THE BLOOD.

Anæmia. CLASSIFICATION. The classification of anæmia has been a matter of considerable difference of opinion, and medical opinion has

¹ Münchener medicinische Wochenschrift, April 18, 1899.

² Il Polyclinico, February, 1899.

varied from time to time with varying views of general pathology. In the earlier days names were applied which were intended to designate particular types of anaemia whose distinctions were founded in the clinical characters of individual cases. Thus the terms chlorosis, pernicious anaemia, etc., were given without any special thought of a scientific classification and without any attempt at establishing the mutual dependencies of these diseases. When the necessity of more accurate classification became clear, attempts were made to distinguish cases of anaemia due to excess of consumption of blood and cases dependent upon imperfect or inadequate formation of blood, and the haemolytic and haemogenetic varieties of anaemia were introduced. At about the same period the names primary and secondary were employed to designate anaemias dependent upon primary disease of the blood-making organs on the one hand, and those secondary to various organic or systemic diseases on the other hand. A close study, however, of different anaemic affections shows that neither of these classifications is of practical usefulness nor founded in fact. Most of the anaemias, whether of the group that has with some propriety been designated primary, or of the secondary group, exhibit evidences of faulty haemogenesis, together with signs of increased destruction of blood. The anaemia is, therefore, a mixed one from the point of view of its origin. The attempt to show that certain cases are primary anaemia and others secondary anaemias, in the strict sense of these terms, has also failed; for it may be doubted whether any one of the anaemic conditions with which we are familiar owes its origin and continuance solely to disorder of the blood-making organs. Primary anaemia, in the sense of a disease of the blood, cannot have any existence, notwithstanding the eminent authority that has supported this view. Recent authorities¹ have expressed much the same view as that which I have just given, and have offered as a temporary suggestion (excluding chlorosis) the following classification :

1. Simple anaemia.
 - (a) Acute post-hemorrhagic anaemia.
 - (b) Simple chronic anaemia.

2. Progressive pernicious anaemia.

This classification is based upon the distinctions in the anatomy and physiology of the blood rather than upon any thought regarding the original causes of the anaemia, and until such a satisfactory and scientific classification is possible the present is offered as a substitute.

Krönig,² in his papers on the classification of anaemia, refers to chronic simple anaemia as one of the forms. By this term he designates cases

¹ Ehrlich and Lazarus. Nothnagel's System, 1900, vol. viii., No. 1.

² Eulenburg and Samuel's Lehrbuch der Allg. Therap., etc., 1899.

of chronic anaemia with a congenital origin. Sometimes hereditary factors, such as phthisis, syphilis, etc., play a part, and the child from the beginning is badly developed and emaciated, with weakened musculature; in other cases rickets, enlargement of the glands, and catarrhal conditions are the indications of a chronic anaemia. Sometimes energetic treatment in the child causes arrest of the disease; in other cases, however, it may persist throughout life. He believes that in these cases there is a constitutional tendency to weakness of the haemopoietic or lymphatic system, inasmuch as the latter are seemingly predisposed to recurring inflammatory irritations. Sometimes this chronic simple anaemia appears in otherwise healthy individuals in consequence of continued work, of badly ventilated and poorly lighted rooms, taking at this time insufficient sleep and nourishment, and being subjected to other predisposing influences. Patients of this sort are apt to be greatly depressed, tiring very easily with any physical or mental work, and are prone to suffer with atonic weakness of the gastro-intestinal tract, causing loss of appetite and constipation.

It is undoubtedly true that instances of anaemia of the sort described by Krönig are quite frequently observed, and it is a matter of some difficulty to reach a satisfactory classification in individual instances. It may be true that some of them represent cases of reduced haemato-genetic function, and that the anaemia is, therefore, in the strict sense a primary anaemia, but the majority of cases are doubtless secondary to other conditions; for example, the atonic dyspepsia to which the author refers as a result of chronic simple anaemia is certainly in many instances a cause, and perhaps the principal cause in some.

Pernicious Anaemia. **ETIOLOGY.** Hunter¹ discusses the etiology of pernicious anaemia with special reference to the probable infectious character of the disease. His views upon the subject of haemolysis in pernicious anaemia are well known and have been widely adopted. He points out in the present series of articles that the changes found in this disease are suggestive of a poison formed in the gastro-intestinal tract and absorbed from the mucous surface. He thinks that such poisons can be the result of the action of some specific organism flourishing in the gastro-intestinal tract. In a study of seven cases of pernicious anaemia it seemed to him that carious conditions of the teeth were accountable for the gastro-intestinal disturbances which undoubtedly play a part in the etiology as well as in the symptomatology of the disease. His observations lead him to the following conclusions: (1) Pernicious anaemia is a special form of blood-poisoning—a toxæmia; (2) it is the result of a special infection of the digestive tract, especially

¹ London *Lancet*, January 27, February 3 and 10, 1900.

the mouth and stomach, and, to a less extent, the intestines ; (3) long-continued necrotic conditions of the teeth are the chief source of infection ; (4) the usual result of this infection is a chronic catarrh of the mouth and stomach, leading in time to deeper changes, such as ulcers, chronic inflammations without atrophy, and, in the case of the stomach, chronic inflammations with atrophy of the glands ; (5) the infective nature of such gastro-intestinal conditions following poor dentition cannot be doubted ; (6) the infection is generally streptococceic, and no doubt is often mixed in character ; (7) previous disease of the stomach makes it more liable to infection ; (8) the gastric and intestinal symptoms so often noted result from the infective catarrh, while the haemolysis is the result of the action of poisons ; (9) fever is not accidental, but is the result of the infective process itself, and its fluctuation corresponds to variations in the underlying process ; (10) variations in the progress of the case are extremely numerous and frequently repeated ; (11) long periods of improvement lasting for months or a year or more, followed by relapses, are frequently met with in this disease. He regards this condition as the result of a relative immunity unfortunately only temporary in nature, the immunity being due to the disease itself. As a result of these conclusions he suggests (a) minute attention to hygiene of the mouth, and especially the teeth ; (b) stronger antiseptic treatment of the stomach and intestines ; (c) antitoxic serum treatment with the view of antagonizing within the blood itself the poisons absorbed into it. Frequent lavage, salicylate of bismuth, and salicylic acid are suggested, and when intestinal irritation is indicated by the symptoms, salol, menthol, calomel, and mercuric chloride are recommended. He purposes using antistreptococceic serum, because he finds that in all cases pyogenic organisms are at least in part concerned in this disease.

The observations of Hunter, though suggestive in certain directions, are entirely lacking in the scientific foundation that characterized his early studies of this disease. All authors who have considered pernicious anaemia in recent years have laid stress upon the probable relations of gastro-intestinal conditions throughout the disease, and the interesting observations upon bothriocephalus anaemia in particular make it seem altogether likely that the absorption of toxic bodies from the gastro-intestinal tract plays an important rôle in the etiology. It may further be admitted that improper dentition is concerned in many instances of gastric disease, and it may or may not be true that infective agents co-operate in such gastric disease, but it is far-fetched to conclude that pernicious anaemia is the result of such secondary gastric disease. In the overwhelming proportion of cases of dentition only chronic gastritis results. Why, then, in the smaller proportion of cases should

we have atrophic gastritis with symptoms of pernicious anaemia? The essential cause lies here, and the improper dentition, like age, sex, conditions of life, etc., is merely an incident or an unimportant causal factor. It would be idle to criticise the view expressed regarding the nature of fever in pernicious anaemia. If the author contended for a general infection and not for a local infection, a view such as he expresses might be accepted more readily; but the well-known tolerance of the system to gastric disorders and the rarity of fever in such conditions make it unlikely that in this special form of gastric disease fever should be so regularly present. Moreover, in post-hemorrhagic anaemia, in chlorosis, and in fact in all forms of anaemia, fever is a symptom of common occurrence, and it is unnecessary to assume a local infective process to explain it. The haemolysis itself, which we acknowledge and which Hunter has been so largely instrumental in demonstrating, is conceivably capable of producing toxic substances which may be pyrogenic in character.

The search for a specific micro-organismal cause of pernicious anaemia continues; but thus far nothing has been discovered that promises to be of permanent value.

J. G. Adami¹ discusses latent infection and subinfection and their relation to the etiology of haemochromatosis and pernicious anaemia. He first discusses the existence of micro-organisms in the tissues during life, and refers to some experiments conducted by Nichols and Ford. These investigators found comparatively large numbers of bacteria in livers and kidneys removed from animals immediately after death, under aseptic precautions, and subsequently placed in agar and kept at body temperature. Adami believes that normal leucocytes pass the mucous membranes, particularly those of the digestive tract, carrying bacteria into the lymphatics or small veins of the portal system. The bacteria usually degenerate, or are digested; but they have been found in the liver of healthy rabbits, and it is probable that they may reach the general circulation, perhaps indirectly through entrance into the thoracic duct, and thus into the blood-current; they are then excreted by the kidneys. This condition he considers probably analogous to the "latent infection" described by the French. Under ordinary circumstances these micro-organisms cause no disease and do not proliferate; but he thinks that there is a condition which may be called subinfection, which is produced by a large number of bacteria entering the blood and exciting excessive activity of the lymphatic glands, kidneys, or other organs in the attempt to destroy the micro-organisms, thus producing chronic inflammatory trouble. Adami directs attention

¹ Medical News, January 6, 1900, and Journal of American Medical Association, December 16 and 23, 1899.

to his previous work on cirrhosis of the liver, in which he found small diplococci, which he was inclined to consider a form of the colon bacillus. Cirrhosis is sometimes accompanied by the deposition of an excessive amount of pigment, resulting from the destruction of the blood, and the same decomposed pigment is found in pernicious anaemia. This led Adami to investigate the livers of patients dying of pernicious anaemia, and he found the same organisms. He believes, therefore, that pernicious anaemia is probably associated with subinfection.

As I have said, the view of many authorities at the present day would make us accept the toxic nature of the disease and the probable origin of the toxins to be the gastro-intestinal tract. The nature of such toxic agents has not, however, been determined, even remotely, and the nature of the intestinal processes which occasions their production is almost equally obscure. H. Strauss¹ found in a case of pernicious anaemia associated with achylia gastrica that the anaemia was not due to any lack of absorptive power of the intestinal tract, since all but 8 per cent. of the nutrient was absorbed, thus proving normal limits. The study of metabolism showed a retention of nitrogen. The fat absorption was about normal, but the fat-splitting was imperfect. The investigation of absorption with methylene-blue further showed that it was normal. Finally, the study of the amount of ammonia in the urine showed the absence of acid intoxication, and ptomaines and ferments were absent from the urine and the stools.

Some interesting facts regarding the predisposing causes are presented by Ehrlich and Lazarus.² Among 148,000 patients treated in the hospitals of Berlin, pernicious anaemia occurred in 274, or 0.2 per cent. Of these, 172 were of the female sex and 102 of the male sex. Among 240 cases collected from literature the ages were as follows: First decade, 1 case; second, 22 cases; third, 61; fourth, 67; fifth, 47; sixth, 33; seventh, 7; eighth, 2.

The authors very properly warn against the diagnosis in young infants, on the ground that the blood in infancy does not correspond closely with that of adults. They do not, however, deny the possibility of cases in infants.

DIAGNOSIS. It was customary a few years ago to include under the head of pernicious anaemia only cases of such obscure origin that the underlying causes could not be recognized. According to this view, cases of profound anæmia, with exactly the same clinical course, but in which distinct causes could be determined, were excluded and relegated to the category of secondary anæmias. Fortunately this classification

¹ Berliner klinische Wochenschrift, March 6, 1899.

² Nothnagel's Specielle Pathologie and Therapie, vol. viii., part 1.

has been largely abandoned, and it is recognized by most authorities that pernicious anaemia is not a distinct entity, but rather a group of clinical symptoms that may have different causes. Doubtless there are certain pathological processes that are common to all of these, but the pathology and pathogenesis as a whole may be very varied. Ehrlich and Lazarus¹ state that the disease is common: (1) In cases in which there have been repeated or long-continued hemorrhages; (2) in cases in which poor nourishment, wretched surroundings, overwork, and other like causes have operated destructively upon the health; and (3) in consequence of other diseases, especially of the gastro-intestinal tract, and among others syphilis, malaria, and typhoid fever.

It is clear that the diagnosis of the disease must be made from a consideration of the character of the blood and the clinical course rather than from any thought of the possible causes.

J. C. Da Costa² describes a case which he considered grave secondary anaemia simulating progressive pernicious anaemia. The patient was forty-seven years of age, and showed profound anaemia, with a lemon tint of the skin. He had had a prolonged history of digestive disturbances, which began with dysentery accompanied by jaundice. He had repeatedly had attacks of gallstone colic since the dysentery, the attacks being accompanied by fever; he had also had attacks of fever at other times. Shortly before admission he had vomited blood. The left lobe of the liver was slightly enlarged, but the spleen was of normal size. The urine was normal. Blood examination showed 17 per cent. of haemoglobin and somewhat over 2,600,000 red cells, with 12,000 leucocytes. There was poikilocytosis, and megalocytes were present, but no nucleated red cells were found. Owing to the disproportionate reduction of the haemoglobin, the increase in the white cells, and the absence of the nucleated red cells, he excluded pernicious anaemia and considered that the case was to be classed as one of severe secondary anaemia following digestive disturbance. The stomach contents showed but slight acidity, with no lactic acid, and the case was called one of achylia gastrica.

J. S. Billings, Jr.,³ describes five cases of profound anaemia in which nucleated red corpuscles were absent, stating that these are the only cases which he has observed in which the reduction of red corpuscles was below 1,500,000, and in which there were no nucleated red corpuscles present. He concludes that in such instances the regenerating power of the bone-marrow is wanting, and the prognosis is correspondingly grave.

¹ Nothnagel's *Specielle Pathologie und Therapie*, vol. viii., part 1.

² Philadelphia Medical Journal, December 30, 1899.

³ New York Medical Journal, May 20, 1900.

Ehrlich, in his early papers, called attention to the abundant megaloblasts found in pernicious anaemia, and pointed to these as an indication of poor haemogenetic function, maintaining that their presence was of prognostic importance. The observation of Billings is in the same line, though it goes somewhat further. I have not myself believed that the teaching of Ehrlich was entirely reliable in this respect, having observed cases of very acute pernicious anaemia without megaloblasts, but with the presence of large numbers of normoblasts, and other cases in which no nucleated red corpuscles of any kind occurred.

Verdeen¹ gives a general description of ankylostomum anaemia. The anaemia he considers due to the repeated abstractions of blood, the secondary disease in the intestines, and the toxic products of the worms; but he thinks the unhygienic surroundings of the subjects, their abuse of alcohol, and their overwork are all important in emphasizing the effects of the parasites. He notes the importance of avoiding the use of castor oil with felix mas, since this is likely to cause marked toxic symptoms, the castor oil dissolving the poisonous principle of the extract of felix mas and aiding in the absorption of this poison. Felix mas, however, and thymol are the most important drugs in the treatment of this condition. Thymol often causes gastric distress, which is usually relieved by the use of ice or ice-cold water.

COMPLICATIONS. M. Nonne,² in discussing the *changes in the spinal cord* in pernicious anaemia and other conditions, notes that certain authors consider that the alterations start from the bloodvessels, while others think that they are systemic diseases. He describes the conditions found in twelve cases of anaemia, some pernicious and some secondary, the result of hemorrhage and the like. The pernicious cases in some instances showed no changes, sometimes early changes, and sometimes characteristic degenerations. Hemorrhage alone seemed to cause no spinal changes. In one case of marked secondary anaemia resulting from chronic nephritis, spinal changes similar to those seen in pernicious anaemia were observed. Clinical symptoms were not common, the most frequent being paraesthesiae and loss of the knee-jerks. The nutrition of the spinal cord, particularly of the white substance, is poor in cases of pernicious anaemia, the gray matter being less affected than the white. Hemorrhages are often found, and seem to be the accompaniment of the other conditions. In the negative and in the early cases the vessels were not involved, but in the advanced cases they always showed changes. If a toxin is to be considered the cause of the changes it would have to be transported by the bloodvessels. In such instance

¹ Echo médicale du Nord, January 4, 1899.

² Deutsche Zeitschrift für Nervenheilkunde, 1899, Bd. xiv., Heft 3 and 4.

it would seem probable that in sepsis similar changes would be seen, and in the examination of nine such cases alterations were found. Ten cases of senility were likewise examined. These patients did not show nervous symptoms, but had marked arterio-sclerosis. In all cases there was notable growth of the glia and thickening in the bloodvessels, and the interstitial thickening was particularly marked about the bloodvessels; but in one case of especially advanced arterio-sclerosis the spinal changes were not striking, hence the arterio-sclerosis did not seem to be a direct cause. Nonne considers that in such instances the same thing occurs in a slow way that occurs in anaemia rapidly—that is, a degeneration as the result of the action of poisonous substances carried by the bloodvessels.

Schwabach¹ discusses the *conditions of the ear* which were seen in seven cases of pernicious anaemia, and reports a microscopical study of one case. The drum membrane was notably changed in only one case. In this there was a small ecchymosis of the membrane, with some reddening about it, which was followed by suppuration and perforation, which later healed. The usual symptoms of affection of the ear consist in noises in the ear and alterations in the acuity of hearing. Schwabach's examination of 200 of these cases led him to believe that the affection lies in the sound-conducting apparatus, which opinion was confirmed by finding that the microscopically examined case showed entire absence of changes in the true hearing apparatus (the labyrinth, etc.), while the middle ear showed changes consisting chiefly of extravasations of blood. Schwabach notes the similarity between these changes and those seen in leukæmia.

Neusser² has recorded a number of interesting cases of pernicious anaemia with complications. One instance was a case of *exophthalmic goitre*, in which toward the end of the disease severe diarrhoea and vomiting and finally jaundice occurred. The last-named symptom he believes was due to intoxication, the result of exophthalmic goitre. In a case of severe pernicious anaemia with gastric atrophy the nitrogen equilibrium was found to be maintained. Another case was interesting from the occurrence of pernicious anaemia in association with a *hemorrhagic diathesis* and hypoplasia of the arteries. In this case the anaemia occurred during pregnancy, and Neusser explains it by assuming that blood-forming organs attempt to make up for the increased demand—which in this case was pregnancy—and sometimes are unable to accomplish it. The hypoplasia of the vascular system may have been the anatomical cause of this inability. He attempts to divide cases of pernicious anaemia into those in which there is evidence of degeneration of

¹ Zeitschrift für Ohrenheilkunde, Bd. **xxxv.**, Heft 1 and 2.

² Wiener klinische Wochenschrift, April 13, 1899.

the bone-marrow, as shown by the presence of many megaloblasts ; those without reaction of the bone-marrow, and those with deficient reaction.

TREATMENT. Among the remedies suggested for the treatment of pernicious anaemia, bone-marrow has been highly recommended, though its value is certainly not well established. In some cases it has seemed to be useful, but more often it is useless. Fowler¹ has made an experimental study of the value of red bone-marrow in anaemia. He took four young rabbits from the same litter and fed them on different diets —one diet poor in iron, one defective in iron and proteid, another in proteid alone, while the fourth rabbit was given its usual food. The most marked decrease in haemoglobin occurred with the diet deficient in iron ; the corpuscles were reduced most severely when the proteid was deficient, while the carbohydrate diet caused the most decided general alteration in the blood. This diet was used to produce anaemia in the animals, and the anaemia was treated with red bone-marrow. In considering the results of his experiments upon healthy animals and those made anaemic, he decides that the subcutaneous use of bone-marrow has no effect upon the blood of healthy animals, but that it does cause a decided improvement in the corpuscles and haemoglobin in animals made anaemic. The improvement is sudden and of short duration. The cells did not improve in form coincidently with their improvement in number and in haemoglobin. The active principle of the bone-marrow is extracted by water, but not by alcohol ; it does not contain iron and is not precipitated by boiling. Fowler suggests that it may be a deuteroproteose.

Burghart² records his use of extract of spleen and thymus gland in a case of pernicious anaemia and in some cases of chlorosis and other anaemias occurring in girls. The only interesting result was an improvement of red cells and an increase in haemoglobin in one case of secondary anaemia.

Chlorosis. **ETIOLOGY.** Nothing new has been added in the past year to previous knowledge regarding the nature of this disease. Most authorities agree in regarding it as a disorder of the blood-making function, though the exact pathological condition that determines this weakness is still a matter of theory rather than of well-determined knowledge.

A. Hoffmann,³ in discussing the question, gives as his explanation of the nature of chlorosis that it involves an imperfect functionation dependent upon hypoplasia of the blood-forming organs, occurring about puberty, and in severe cases accompanied by hypoplasia of the circu-

¹ Scottish Medical and Surgical Journal, September, 1899.

² Deutsche medicinische Wochenschrift, September 14, 1899.

³ Münchener medicinische Wochenschrift, 1899, No. 29.

latory organs and the genital organs. This weakness of the blood-forming organs shows itself in the production of cells which are of imperfect form and contain an insufficient amount of haemoglobin. (This explanation is evidently purely an hypothesis, and is scarcely an explanation in any sense.) Hoffmann believes that the effect of blood-letting in chlorosis is due to the stimulating action upon the bone-marrow.

PATHOLOGY. Gautier¹ finds that the heart is generally enlarged in chlorosis, especially toward the right side. Improvement in the condition of the blood was attended with a reduction in the size of the heart. He believes that the cardiac muscle is usually weak in this disease, and therefore liable to dilate. This weakness is not of the nature of a special degeneration, but an indefinite form of muscular weakness due to the general causes of the disease. His observations seem to him to disprove the view of Virchow that there is a congenital smallness of the arterial system. Such a state, he thinks, would produce permanent cardiac enlargement. It is to be recalled, however, that those who have described a vascular hypoplasia in chlorosis have also pointed out that the arterial channels are abnormally elastic and that the condition is a symmetrical one. Further, a convincing disproof of his claim that permanent hypertrophy ought to result from vascular hypoplasia is furnished by the fact that in this condition (with or without chlorosis), such hypertrophy has been wanting.

TREATMENT. Iron is as much a specific in the treatment of chlorosis as any remedy can well be, but there is still some difference of opinion regarding the value of its various forms in the treatment of chlorosis and of other forms of anaemia. According to some, the inorganic preparations alone are useful, while others hold that the vegetable combinations and organic iron compounds are of value.

In his discussion of the treatment of chlorosis, Krönig² refers to this matter, and comes to the conclusion, which accords with my own very well, namely, that the iron in some way or other stimulates the bone-marrow and more generally the blood-making structures. He assumes that there is a torpor of the bone-marrow of a double character: first, a torpor of action or a purely functional sluggishness, and secondly, a torpidity due to weakness of the circulation. The "production torpor" may show itself in an insufficient number of erythroblasts or in the failure of the latter to become transformed into erythrocytes. The administration of iron in considerable quantities has the power, apparently, of

¹ Deutsche Archiv für klinische Medicin, Band Ixii., Heft 1 and 2.

² Allg. Therap. der Krankheiten des Blutes, etc., extracted from Eulenburg and Samuel's Lehrbuch der Allg. Therap., etc., 1899.

stimulating the germ centres of the bone-marrow, and thus aiding in the more rapid production of blood-corpuseles. This may be a direct action or it may be indirect and consequent upon a stimulation of the circulation.

There does not seem much doubt but that some action of this sort is exercised by iron as well as arsenic. The form of iron may be either inorganic or organic. Of the latter, according to von Noorden's table, carniferrin contains the largest proportion of iron, 0.33 gm. of this substance furnishing 0.1 of metallic iron. Other organic combinations are given in the proportion of their relative strengths. A similar table taken from Quineke shows that the strength of the inorganic preparations is relatively very much greater. Reduced iron, of course, represents full strength. The sulphide of iron is second in the list, and the carbonate ranks third. Of the ferruginous waters there are two groups: those containing iron in the form of a carbonate, and sulphur-containing waters. Some of the latter, in addition to the iron, contain notable quantities of arsenic. The carbonic waters are the more easily borne by the stomach. Regarding the dosage of these waters, the author advises that the daily quantity should be about one-half litre, and only rarely more than this amount. The water should be taken in several doses, and preferably two or three hours after a meal. The amount of iron that can be administered in this way is comparatively small.

In administering iron, the rule laid down by Krönig is to start with daily doses of 0.05 g. of metallic iron at the beginning, increasing rapidly in the first week and a half to a daily dose of 0.1 to 0.15, and continuation of this dose during two or three weeks, and then a gradual declension to the normal. I have myself found that larger doses than this are advantageous in many cases, especially of relapsing chlorosis. If we accept the older theory, that the iron simply subserves the purpose of supplying a certain amount of lost iron to the haemoglobin of the blood, these amounts of iron administered in the form of medicine would be entirely unnecessary, but considering the matter from the other point of view, that the iron simply acts as a stimulant to the blood-making functions, the dose of administration may reasonably be very much greater.

In discussing other measures in the treatment of anaemias, especially the chronic varieties and so-called simple anaemia, Krönig refers to hygienic regulations and especially to diet. He advocates forced feeding with essential inclusion of the albuminous foods (meats, eggs, preparations of tropon, etc.); at the same time, however, carbohydrates, particularly in the form of vegetables containing saline and ferruginous constituents, such as spinach, asparagus, apples, strawberries, etc. With regard to bathing, he recommends short sea baths of from two to eight

minutes ; instead of these, occasionally rapid rubbing with sea water or warm salt baths.

In speaking of the treatment of chlorosis, the matter of keeping the patient in bed is discussed, and the author very wisely recognizes that in the first week or two absolute rest in the horizontal position is highly desirable, if not essential.

Organic extracts which have been lauded in the treatment of various forms of anaemia are dismissed with comparatively little discussion.

P. Hári¹ administered iron to animals, and was then able to demonstrate the presence of this substance in the epithelial cells of the stomach. He placed the entire stomach in Hall's solution, and thus brought out certain dark islands, which, on microscopical examination, showed the presence of iron within the epithelial cells. Stomachs of animals which had received no iron gave no such reaction, and the absorption took place during life, since the lesions were not produced when iron was introduced into the stomach after death.

W. Rosenstein² has studied a number of preparations made from the blood of animals in the treatment of anaemia, and has found that none of these is of any special value. The subcutaneous use of blood or haemoglobin may be of considerable value, because a large part of the iron is absorbed, but he holds that it has not been shown that iron is absorbed from the gastro-intestinal tract. It is necessary to point out, however, that the subcutaneous use of blood or preparations of blood is not without distinct danger to the individual. Completely aseptic preparations are difficult to obtain, and infection of the injected area could very easily occur after injection.

Whatever may be said of the usefulness of one or another preparation of iron or of iron in general, it would be fallacious to regard this remedy as the only measure of treatment necessary in the management of cases of chlorosis. General hygienic regulations may in themselves suffice to cure the disease by increasing vitality or by removing the causes of the continuance of the disorder.

The *advantages of venesection* in the treatment of chlorosis were considerably discussed a few years ago after the appearance of an article by Dyes, of Hanover. There can be no doubt that useful results have been achieved by this plan of treatment, and the contributions of Wilhelm, Schultz, Schubert, Krönig, and Baginsky may be cited in this connection. The results have sometimes been peculiarly satisfactory in cases of severe and persistent chlorosis. Regarding the amount of blood to be taken, Dyes established the rule that the quantity should

¹ Archiv für Verdauungskrankh., Band iii., Heft 2.

² Deutsche medicinische Wochenschrift, April 27, 1899.

equal in grammes the pounds of weight of the individual under treatment.

Krönig¹ advises that not more than a half of this amount of blood should be drawn, and never more than one hundred grammes. Further, he believes that the method should be used only in cases in which other plans of treatment have been tried and have failed. There may be, of course, a considerable difference of opinion as to the value of this method of treatment, but if it has been proved to be useful, the author's contention that it should be employed only after all other plans of treatment have failed seems unreasonable.

Leukæmia. **ETIOLOGY.** Among the theories regarding the etiology of leukæmia that which has ascribed an infectious origin to the disease is of particular interest. The clinical course of some cases has been very suggestive of infection, and in particular the cases of acute leukæmia described and collected by Ebstein, Fraenkel and others are most important in this direction. Investigators have found micro-organisms of one sort or another in the blood or tissues after death from leukæmia, and some of the authors have been inclined to regard their discoveries as revealing the true specific cause. It is worthy of note, however, that bacteriological studies after death in various diseases may reveal the presence of one or another micro-organism whose presence may be more properly ascribed to terminal infection than to the existence of a specific bacterial agency. In addition to the bacteria, a few observations of bodies in the blood and tissues having a resemblance to animal organisms have been reported. It must be admitted, however, at the present time that none of these studies has been sufficiently conclusive to indicate a probable relationship between the supposed organism and the disease.

Recently, Löwit has entered this field of work, and has published his conclusions based upon observations extending over a period of years. In a preliminary contribution² he describes a large amoeba, which he has discovered in this disease. This organism multiplies by spore formation. He claims to have found it in the peripheral circulation and in the blood-making organs. It was rarely found in the peripheral circulation in lymphatic leukæmia, but more commonly in the ordinary form of disease. In addition to this, he found in the blood-forming organs a small intracellular amoeba. The former larger form he regards as significant, particularly of the myelogenous type. Sometimes the two forms are associated. He also found these organisms in pseudo-leukæ-

¹ Allg. Therap. der Krankheiten des Blutes, etc., extracted from Eulenburg and Samuel's Lehrbuch der Allg. Therap., etc., 1899.

² Centralblatt für Bakteriologie und Parasitenkunde, 1899, Nos. 8, 9.

mia, and claims to have been able to produce infection, with leucocytosis, in animals, though he has not been able to cultivate the organism.

In his complete report¹ he describes his methods of study and his investigations in animals as well as his attempts at cultivation, etc. He points out that the demonstration of the amoeba in the blood requires fixation with heat, as the alcohol fixation prevents proper staining of the organisms. Several methods of staining may be adopted, the methylene-blue of Löffler being very satisfactory. The specimen is placed in the stain in a small watch-glass and heated, then allowed to cool, for which it requires about five or ten minutes. It is then carefully washed and differentiated in 0.3 per cent. HCl-alcohol; then again washed and mounted. The amoebæ which are figured in the beautiful illustrations accompanying the paper are stained in a metachromatic manner. At first it is advisable to decolorize excessively, which will decolorize all bodies except the basophile granules and the amoeboid bodies in question.

These specific bodies are either within the leucocytes or attached to them, very often distinctly in the interior. They have either a clustered amoeboid appearance or a granular formation. Sometimes both forms are found in the same cell. They have a certain resemblance to the basophile granules, but can be distinguished from these especially by the behavior toward alcoholic fixation. They were especially frequent in or attached to the smaller leucocytes—the so-called lymphocytes—but were occasionally present in the larger leucocytes and the myelocytes. They have been very rarely present in the polymorphonuclear cells and in the eosinophile leucocytes. Occasionally bodies having the same general appearance were found in the plasma. They occasionally contained vacuolated areas, which the author regards as in some way dependent upon methods of staining. He thinks these are perhaps the result of some innate construction, which is demonstrated only by certain methods of staining. Segmented forms are described, and also a navicular variety. The author speaks confidently of these bodies as specific of the myelæmic blood. He concludes that they are not related in any way with any of the known morphological constituents of the blood, and are not identical with any of the products of retrograde metamorphoses of the leucocytes or their nuclei. It would, therefore, be proper to regard them as specific bodies.

Regarding the types of leukaemia, he does not admit the applicability of the terms myelæmia or myelocyte-leukaemia as indicating the presence of constituents of the bone-marrow, but rather as being associated with the parasite described. In short, he would describe this form of

¹ Die Leukaemia als Protozoeninfektion. Wiesbaden, J. F. Bergmann, 1899.

leukæmia as the result of infection with his Hæmameba leukæmia magna. He suggests the name polymorpho-lymphocyte-leukæmia, or poikilocyte-leukæmia, as more proper for this variety. As far as lymphæmia, or lymphocyte-leukæmia, is concerned, he would abandon these names as being misleading, and would give the name homoioocyte-leukæmia. He believes the latter dependent upon the Hæmameba leukæmia parva (*vivax*).

NATURE OF LEUKÆMIA. The nature of this disease is still uncertain despite the amount of work that has been bestowed upon its study. A number of older theories have been found untenable, and at the present time two only merit discussion. The first of these classifies leukæmia with neoplastic processes, especially sarcoma; according to the second, the disease is a form of leucocytosis, possibly infectious or toxic in origin. The arguments in favor of these theories are reviewed at length by Taylor.¹ As evidences in favor of the neoplastic theory he cites the apparently causeless onset of the disease in many cases, the marked hyperplasia of the lymphatic tissues, the close relationship with Hodgkin's disease and lymphosarcoma, and the wide-spread secondary deposits. As arguments against the theory he cites the acute infection-like onset of some cases and their rapid course, the absence of certain characters, such as pathological mitosis, seen in well-known neoplasms, the response to medicinal treatment, and the fact that hyperplasia like that of leukæmia may occur in the bone-marrow and other lymphatic structures in experimental and other infections. In favor of the leucocytic view he refers to the generally accepted explanation of leucocytosis and the analogies offered by the study of the blood and tissues in leukæmia, to the types and varieties of leukæmia, and to the variety of cells involved in the increase of leucocytes seen in the blood.

He would explain the extrahaematopoietic collecting of cells as being largely the result of deposition and to a small extent the consequence of local proliferation.

In accordance with his view of the nature of the disease he distinguishes two types: the lymphocytic and the myelogenic or leucocytic, and further recognizes certain mixed cases. In instances of lymphocytic leukæmia in which excess of the total number of polymorphonuclear leucocytes has been found he assumes that there is a complicating infectious leucocytosis grafted on a primary leukæmia.

It is often surprising to notice the narrowness that may be developed by following one line of thought and research so closely as to exclude all consideration of possibilities in other lines, and in no class of inves-

¹ "Studies in Leukaemia." Contribution from the William Pepper Laboratory of Clinical Medicine, 1900.

igations has this been more evident than in the study of the blood. The impetus given by Ehrlich's work was so tremendous that for years almost the sole interest of writers seemed to be in the minute morphology of the corpuscles ; chemical changes were left almost unconsidered, and even important clinical facts were left in the background, while theories were built and are still built upon observations of slight differences in staining reactions and the like. That most such theories are faulty and must be faulty can but be evident if we only realize that staining reactions are chemical processes, and differences in staining are merely expressions of some chemical changes, while alterations in form are only the evidences that something has caused the change. Breadth of view almost always makes problems seem difficult, and hence breadth seems often to be deliberately shunned, but it is only by broad considerations that satisfactory advance can come.

A timely paper that should be heeded comes from Minkowski,¹ who lays emphasis upon the fact that morphological methods alone are insufficient for the solution of biological problems, and that in studying leukaemia it is extremely important to take into consideration the clinical aspect of the cases as well as the morphology of the blood, and, further, to make careful chemical studies. Recent investigations have shown the most important chemical elements of the leucocytes to be nuclein acid and protamin. These are combined with albumins to form nuclein and histon. The lymphocytes contain nucleohiston almost exclusively. Nuclein and protamin seem to have decided bactericidal properties, and perhaps are important in fixing other substances and transporting them through the body. The micro-chemical reactions as stains are certainly due largely to reactions with these chemical bodies. Nuclein acid is polybasic, and therefore sometimes forms acid and sometimes basic combinations, hence the staining reactions are variable. Minkowski found that the nuclein acid of the polymorphonuclear leucocytes and that of the lymphocytes are identical, but that the lymphocytes contain much more than the polymorphonuclear. He has also found two substances which give the biuret reaction, but are not identical with Miescher's protamin. He suggests that the further study of the chemical substances contained in the cells will, perhaps, make clear the differences between the different white corpuscles and the character of the granules. Minkowski also objects to the recent teaching that uric acid is a specific product of the reduction of nuclein. In leukaemia one may often find an increase in the uric acid excretion, but he does not believe that this can be directly considered to be the result of the destruction of leucocytes, because both may rationally be thought to be the result of

¹ Verhandl. des XVII. Congr. für innere Med., 1899.

increased cell function and because the uric acid may be the product of the nucleins introduced with the food, and, in fact, an exact parallelism between the number of leucocytes and the amount of uric acid excretion is not always observed, in spite of numerous claims that this is the case.

Minkowski does not believe that the quantitative changes in the blood in leukaemia are due to the original situation of the disease, but rather to the character which the disease has assumed in the organs affected. He describes three forms of leukaemia. The first, a genuine general leukaemia. In this the enlargement of the spleen is very marked, and this form is commonly called lienal. The blood picture in this disease is usually distinctly polymorphous. The probable cause is infection. The second class includes acute leukaemia. This has an exceedingly rapid course, commonly begins with hemorrhages, and is often accompanied by fever. The swelling of the spleen and of the lymphatic glands is usually moderate. Changes in the bone-marrow are always present. The changes in the white cells consist chiefly in an enormous increase of the mononuclear elements. It is even more probable in this form than in the first that the disease is of infectious origin. It is often called acute lymphatic leukaemia, but it has a much closer relation to the first form described than to lymphæmia. A third form is chronic lymphæmia, which is closely related to pseudoleukaemia, and is not readily separated in many cases from malignant lymphoma and lymphosarcoma. It begins usually with swelling of the lymphatic glands in the neck. The spleen is variable. There are marked changes in the spleen and bone-marrow, and leukaemic infiltrations in other organs which are apparently not metastases, but are hyperplastic growths of the pre-existing tissue. The blood picture always shows a marked increase of the lymphocytes. There are numerous cases which do not exactly correspond to any of these classes and cannot be put in any definite group, but those which arise from a progressive pernicious anaemia and the anaemia pseudoleukaemica infantum apparently deserve to be put in separate divisions.

Minkowski does not consider the clinical importance of a leucocytosis particularly great. A polymorphonuclear neutrophile leucocytosis is very frequently seen in infectious processes, but its presence or absence cannot be depended upon in diagnosis or prognosis. There are also no absolute diagnostic conclusions to be drawn from the presence of eosinophilia. The action of organic extracts, of toxins, and of drugs upon the leucocytes has been made use of in the attempt to produce a leucocytosis for the purpose of favorably influencing the course of infectious and other diseases. It has been possible to cause some alterations in the number of the leucocytes in leukaemia in this way; but this is temporary, and it is not certain that decrease of the leucocytes means much change in the progress of the disease. The results

in infectious diseases have not been certain, but perhaps something is to be hoped for in this direction.

EFFECT OF INTERCURRENT INFECTIONS. The possibility that leukaemia is an infectious process is so considerable and is so strongly insisted upon by some writers that the influence of other infections becomes of interest.

E. Körmöczi,¹ in discussing the influence of infectious diseases upon leukaemia, records a case of leukaemia in a man, aged thirty-one years, which was complicated with suppuration in the antrum of Highmore. For some time before his death the patient had fever, which declined and gave place in the last few days of life to subnormal temperature. Within a short time before death the leucocytes were reduced from over 20,000 to as low as 1000 per c.mm., and at the same time the red cells were reduced from 1,400,000 to below 400,000. The leukolysis in this case could not be attributed to chemotaxis, since bacterial poisons act destructively upon the eosinophile cells and the myelocytes, while the ordinary polynuclear cells are increased. In this case the polynuclear cells were not increased and the whole bulk of leucocytes was decreased. The explanation which Körmöczi gives is that the bacterial poisons acted so unfavorably upon the blood-producing organs that they were unable to elaborate either red or white corpuscles, and he concludes that the effect of infectious diseases may be to cause a marked reduction in the corpuscles owing to the tissue-destroying action of the bacterial poisons, or they may cause the polynuclear cells to increase and the others to decrease. In the latter case the action is chemotactic. The two methods of action may be combined. The red corpuscles are commonly but little affected, but when the effect of the toxins is chiefly to destroy the tissues, the red corpuscles also may be very much decreased in number, as they were in this case.

SYMPTOMS. W. H. White and F. G. Hopkins² note that the work of others has shown that the phosphorous excretion in the urine is very much reduced in leukaemia. White and Hopkins report a case of leukaemia in which there was marked leucocytosis, with reduced excretion of phosphorus, and in which the excretion of uric acid was not proportionate to the increase of the leucocytes. As has been noted above, the general opinion has grown to be that marked leucocytosis is accompanied by a corresponding destruction of nuclein, and consequent increased excretion of phosphorus as well as uric acid. Cases such as the one they report and those to which they refer do not confirm such teaching and emphasize the statement of Minkowski.

¹ Deutsche medicinische Wochenschrift, November 23, 1899.

² Journal of Physiology, 1899, vol. xxiv., No. 1.

W. N. Bradley¹ describes a case of acute lymphæmia, or lymphatic leukæmia, which occurred in a boy eight years old. Death occurred eight weeks after the illness began. The early symptoms were enlargement of the cervical glands, dyspnoea, and slight fever. Anaæmia developed rapidly and became pronounced, the dyspnoea grew worse, the spleen enlarged decidedly, and the liver and lymphatic glands less markedly. Examination of the blood showed reduction of the red corpuscles to 1,850,000 and increase of the whites to 85,000, while a differential count showed 59 per cent. of small lymphocytes, only 3 per cent. of polymorphonuclears, and no eosinophiles. There was rapid wasting during the course of the disease.

Ross² describes a case of acute lienomedullary leukæmia in a woman, aged twenty-seven years, who had been well up to five weeks before, when she had given birth to a child. The disease lasted but twenty-five days. There was no fever and there were no hemorrhages, but severe diarrhoea.

J. Politzer³ describes the case of a boy, aged sixteen years, who was exposed to cold, and subsequently complained of general weakness and diarrhoea and became constantly paler. Subsequently there were pains in the neck, petechiae of the skin, and fever, with marked sweating. The liver was found to be enlarged, and there was great enlargement of the spleen. Examination of the blood showed increase of the mononuclear leucocytes, with some diminution of the red cells. The use of quinine in doses of 15 grains daily caused the number of the white cells in relation to that of the red to be decreased from 1 to 27 to the normal, and the spleen became considerably smaller. The fever was unaffected. The patient became worse, however, death following rapidly. The diagnosis was acute leukæmia. The lymphatic glands in general were found enlarged. Politzer also records two cases of chronic leukæmia which were treated with nuclein and tuberculin without any effect upon the course of the disease.

H. Schröder⁴ records the occurrence of repeated pregnancies in association with lienal leukæmia. The patient, who was twenty-five years old, had had five children and had twice miscarried. It was noticed after the birth of the last child that she had a large tumor, which proved to be the spleen. This, she said, had appeared in the sixth month of her pregnancy. Her haemoglobin was reduced to 50 per cent.; the relation of the white to the red cells was 1 to 28, and stained specimens showed typical leukæmia. The lymph-glands were

¹ New York Medical Journal, December 23, 1899.

² Liverpool Medical Institution, March 23, 1899.

³ Wiener klinische Rundschau, 1899, Nos. 13, 14, and 24.

⁴ Archiv für Gynäkologie, Band lvii., No. 1.

not involved. The patient was pregnant when seen, and because of the advancing anaemia and severe dyspnoea labor was induced. She had had some fever at first, but the temperature soon became normal and her general condition improved largely, though the whites increased to the proportion of 1 white to 20 reds. The foetus showed no signs of leukaemia. Schröder recommends the induction of premature labor only when the symptoms of leukaemia are severe and are increasing with the progress of the pregnancy.

K. Kreibich¹ reports the case of a woman, aged sixty-three years, who within six months developed numerous small tumors from the size of a pigeon's egg to a hen's egg, which were reddish-violet in color and were covered by glassy skin. They were somewhat tender upon pressure. They were chiefly seen about the nose, the cheeks, the chin, and the ear, while the lymphatic glands in various regions were much enlarged and the abdominal glands were distinctly palpable. The liver and spleen were slightly enlarged and the sternum was tender upon pressure. The leucocytes were increased; relatively to the reds they numbered 1 to 28, the increase affecting chiefly the mononuclears. The histological examination of the tumors showed that they lay in the deeper portions of the true skin and surrounded the bloodvessels, as an infiltration of cells had entirely the character of mononuclear leucocytes. In the apparently normal skin there were here and there small perivascular collections of these cells, which could be observed only with the microscope. It was evidently a lymphatic leukaemia with leukaemic infiltration of the skin.

Splenic Anæmia has been considered by a number of writers of late. This condition, which has been variously termed splenic pseudoleukaemia, splenomegaly, idiopathic hypertrophy of the spleen without leucocythaemia, etc., is one whose existence as an independent pathological entity must still be regarded as a matter of uncertainty, if not of doubt.

Sippy² has collected and analyzed the literature of the subject, basing his review upon a case of his own. Woillez described a case in 1856 under the title of "Observations of Hypertrophy of the Spleen." The patient referred to in his report was a man of forty years, who was taken ill without apparent cause. Woillez considered it anæmia rapidly progressing to a fatal termination. There was no increase in the number of leucocytes. The first distinctly recorded case, however, was the well-known one reported by Gretzel from Griessinger's clinic in 1866. This was a case in a child of ten months, and Griessinger gave the name

¹ Archiv für Dermatologie und Syph., Band xlvii., S. 185.

² American Journal of the Medical Sciences, November, 1899.

anaemia splenica in describing the case. In 1871, Horatio C. Wood expressed the belief that certain cases of Hodgkin's disease, or pseudoleukaemia, may present a splenic form, the lymphatic glands remaining uninvolved; and the following extract quoted by Osler¹ shows the nature of the cases referred to by Wood: "I now desire to show that there is still a third form of pseudoleukaemia—a splenic variety. Under the names of tumors of the spleen, splenic cachexia, etc., from time far back medical records furnish accounts of cases which I believe represent this affection." Subsequent authors described the condition under the terms already quoted, though the majority of writers have ignored the condition through a failure to recognize distinctive clinical or pathological features. Osler, in his account of diseases of the blood, published in 1885 in Pepper's *System of Medicine*, referred to it only under the differential diagnosis of pernicious anaemia and leukaemia, doubtless because he did not regard it as a distinct disease or even as a syndrome of sufficient importance to warrant separate consideration. At the present time he takes the ground occupied by many authors, that, provisionally, until we have fuller knowledge "it is useful to group together . . . cases of idiopathic enlargement of the spleen with anaemia and without lymphatic involvement, and to label the condition splenic anaemia." It is undoubtedly an advantage in speaking and in writing to apply the term splenic anaemia to cases presenting certain clinical features but whose real nature is obscure, just as there is some advantage in designating as infantile pseudoleukaemia cases of another sort described by von Jaksch. Incidentally, it may be worth while to correct an erroneous impression into which Sippy apparently has fallen in stating that the case reported from Griessinger's clinic was the same condition as that described by von Jaksch. The essence of the latter condition is the leucocytosis accompanying the splenic enlargement.

THE ETIOLOGY OF SPLENIC ANÆMIA it is scarcely worth while to discuss, since the very lack of causal features is one of the distinguishing characteristics. In Osler's recent collection of fifteen cases, five having been previously reported, the matter of etiology is considered in connection with the possible relationship to malaria, and Osler concludes that paludal intoxication has no direct connection with the disease. He could find nothing in his cases to throw any light upon the nature or origin of the anaemia.

In Osler's series twelve cases occurred in men and but three in women, and with one exception all the cases were in adults above the age of thirty-five, the exception being a girl of eleven years. Osler, however, has purposely excluded cases of anaemia with enlarged spleen

¹ American Journal of the Medical Sciences, January, 1900.

in very young children, agreeing in this particular with West and other authors, though differing from some.

It will be observed that the original case of Griessinger was in a child of ten months, and that a number of recently reported cases have occurred in children. It is undoubtedly true, however, that the matter of splenic enlargement with anaemia, in childhood, requires much closer scrutiny than it does in adults, though I cannot agree with those who assert that splenic anaemia is a disease occurring in adults and not in childhood. This opinion is far from correct. At the same time it is desirable to exercise considerable care in making deductions regarding the nature of any form of anaemic disease in childhood. Ehrlich¹ insists upon this in discussing pernicious anaemia.

The cases of Osler are extremely interesting in a number of ways, especially in the frequency of haematemesis.

Among the interesting features in this series is the frequency with which males are affected, twelve out of the fifteen having been in that sex. No deductions can be drawn as to the age, as children were purposely excluded. Four of the patients had had malaria. The author, however, believes that in two cases only was malaria a possible feature in the etiology. The long duration of the condition is in direct contrast with the statements of some authors that the disease runs a rapid course, but agrees entirely with my own experience. The enlargement of the spleen before the development of marked anaemia, the occasional occurrence of pains in the region of the spleen, the frequency of gastro-intestinal hemorrhages (this symptom having brought seven of the fifteen cases to the physician), the occurrence of ascites, the absence of enlargement of the lymphatic glands, and the occurrence of a chloro-anaemic blood-count—relatively high corporeal count and low haemoglobin—are among the conspicuous features.

Osler denies the propriety of classifying this condition as Hodgkin's disease with enlarged spleen, stating that this disease presents a very different clinical picture from Hodgkin's disease—"slight enlargement of the spleen is common enough in Hodgkin's disease, but it rarely attains a large size, and I do not remember an instance in which it caused, *per se*, special symptoms." It is the contention of those who hold to the pseudoleukemic nature of this condition that the splenic enlargement takes the place of the ordinary lymphatic enlargement, and they do not pretend that considerable splenic enlargement occurs in ordinary cases of Hodgkin's disease. Their contentions of the pseudoleukemic nature of the conditions are based upon the supposed pathological identity. This, however, as the summary of Sippy shows, is

¹ Die Anämie, by Ehrlich and Lazarus. Nothnagel's System, vol. viii., No. 1.

ungrounded, though he himself holds to this view. The pathological features are not those of pseudoleukaemia.

The case which Sippy¹ reports occurred in a Russian, aged forty-five years, whose history up to the appearance of the disease under discussion was practically negative. The patient noticed a change in his health three and a half years before he came under observation, when he found a mass in his left hypochondriac region, and also noticed that he was readily fatigued. The swelling in the splenic region was painless. After this he had some nausea and occasional vomiting, his appetite became impaired, and there was diarrhoea for several months. He thought that he had had fever, but never had had chills. He had had repeated epistaxis. Shortly before coming under Sippy's care oedema had appeared and had persisted. The mass had grown slowly but continuously, and had given rise to discomfort and pressure in the epigastric and left hypochondriac regions. His weight had decreased about twenty-five pounds and he was very anaemic. The spleen was found to reach down to within three fingers' breadth of the pubic bone, and extended one inch to the right of the median line; it was not tender, and was of smooth surface. The liver was enlarged and there was some ascites. There was a systolic heart-murmur, and the lungs contained râles, but otherwise, with the exception of his anaemia, his physical examination showed nothing of note.

The blood-count showed 1,740,000 red cells, 5214 white cells, and 30 per cent. haemoglobin; nucleated red cells and abnormal forms of leucocytes were absent, the differential count being about normal at repeated examinations. He was put upon medicinal treatment and placed at rest. He gradually lost strength, and the oedema and ascites increased. A friction fremitus and rub appeared over the liver. Three months after he was admitted the red cells had decreased to 568,000 and the haemoglobin to 10 per cent., the white corpuscles having increased to 8000, probably as a result of local infection from a needle prick in the ear. The spleen grew rather smaller toward death, which occurred four months after he was first seen, the man presenting at that time a marasmic condition.

Autopsy showed great enlargement of the spleen, the organ weighing 2350 grammes and measuring 31 x 16 x 9.5 cm. There were a number of infarcts in the organ, and its color was a uniform red. The liver weighed 2800 grammes; it was firm, but showed no other marked macroscopical changes. There were a number of elevated polypoid-like growths in the stomach; the intestines were normal, and the intestinal lymphatic glands were not enlarged, though there was slight enlarge-

¹ American Journal of the Medical Sciences, October, 1899.

ment of the mesenteric glands. The central nervous system appeared normal, but the bones of the skull were hemorrhagic, and the long bones showed dark-red marrow, which was of soft consistency ; the bones were very fragile.

Histologically the spleen showed marked increase of the reticulum, and in some areas there was decided localized sclerosis about masses of lymphoid cells. The cells showed no decided evidences of degeneration. There was some increase of connective tissue of the liver and marked infiltration of the lymphoidal elements. The retroperitoneal, mesenteric, inguinal, and axillary glands were slightly enlarged and showed some hyperplasia of the connective tissue and lymphoidal elements, chiefly of the former. Microscopically the bone-marrow was made up chiefly of lymphoidal cells and of fine connective tissue network and of some areas of capillary blood-spaces in which blood-corpuses predominated. Nucleated blood-corpuses were present. The polypoid growths of the stomach proved to be proliferating gland structures with round-cell infiltration. A small tumor which was found in the wall of the thorax was composed of fibrous tissue containing lymphoidal cells.

Some experimental work was undertaken in the case relating to the existence of a possible infection. Three months after admission his spleen was punctured, and tubes containing various culture media, and a guinea-pig and rabbit were inoculated. The *staphylococcus aureus* developed upon one tube, but there was no other result, and this organism's presence was very probably due to the local infection of the ear which existed at the time. Cultures were made also at autopsy from the spleen, liver, bone-marrow, and heart's blood. From the spleen and liver the colon bacillus was obtained, and in one tube from the spleen a *staphylococcus* was found. An emulsion of the spleen was made in sterilized water and injected into guinea-pigs and rabbits ; the two rabbits injected died during the following night. Cultures from their blood were negative, and injections of their blood into mice also proved negative. The post-mortem examination of the rabbits and histological examination of their tissues showed nothing. The conclusions arrived at from these experiments were that the presence of the *staphylococcus* was probably accidental and due to the local infection ; the presence of the colon bacillus was of no importance, while the death of the rabbits after the injection of the splenic emulsion probably indicated that the spleen contained some abnormal toxic substance.

In discussing the nature of the disease Sippy considers whether it is probable that the splenic hypertrophy is primary and causes the blood condition, or whether the alterations in the blood are primary. The general evidence goes to show that essential anaemia, while it gives rise

to enlargement of the spleen, does not produce the enormous hypertrophy which is seen in splenic anaemia, and also that the splenic hypertrophy in cases reported has preceded the anaemia ; it is, therefore, improbable that the enlargement of the spleen is a result of the anaemia. As to the question whether the hypertrophy of the spleen causes the severe anaemia and other symptoms of the disease, an answer is difficult, because the function of the spleen is still obscure. Certainly, removal of the spleen has not given rise to any serious symptoms either in man or in animals, and is usually compatible with perfect health ; therefore, one cannot say at once that a loss of the functions of the glands causes splenic anaemia, but Sippy considers it quite possible that an analogy may be drawn between this disease and exophthalmic goitre, the enlarged spleen perhaps having a deranged function and producing toxic substances which cause nutritional disturbances.

FUNCTIONS OF THE SPLEEN. Any investigations which aid in making the function of the spleen clearer are of interest in connection with this affection. Reich¹ reports some observations which he considers leave no doubt that the spleen possesses a haemolytic function. He has seen objects in the frog's spleen which show apparently direct metamorphosis of pigment from the red blood-corpuseles. The changes began in the body of the cells. The protoplasm showed small cavities and defects about the edges of the cells, which were filled with roundish bodies that proved to be haemosiderin upon testing with hydrochloric acid and potassium ferrocyanide. At a later stage there were seen erythrocytes with their bodies half-filled with pigment granules, and finally granular degeneration filled the whole cell. The nuclei shrank and lost their structure. There were also karyolysis and karyorrhexis, with finally the entire disappearance of the nucleus. Observations of this character are of interest and suggest lines of research. It may be, however, that incomplete haemolysis occurs in splenic anaemia, and that this leads to intoxication and excessive blood destruction, or that some primary cause produces enlargement of the spleen, and that this results in excessive haemolysis and resultant intoxication. Such ideas are purely speculative, and further theorization is worse than futile, but experimentation on such lines may prove to be of value.

There have been numerous proofs that in normal persons the spleen is not essential to the continuance of perfect health, and the following case is only added evidence of this. Kraebel² describes a case in which extirpation of the spleen had been done for rupture. Upon laparotomy the spleen was discovered to have been torn into three pieces, two of

¹ Fortschr. de Medicin, 1899, p. 361.

² Deutsche medicinische Wochenschrift, September 7, 1899.

the pieces being entirely loose in the peritoneal cavity. The patient recovered and left the hospital about a month after the operation, at that time apparently in good condition, his haemoglobin being 80 per cent. There was some enlargement of the lymphatic glands, but the thyroid was unaltered.

GLYCOSURIA IN SPLENIC ANÆMIA. H. A. Hare¹ gives a supplementary report of a case considered to be splenic anæmia, or Banti's disease. The examination of the blood showed a normal number of leucocytes, but a large increase in the number of lymphocytes, these corpuscles contributing at one time as much as 84 per cent. of the total number, while the polymorphonuclears were reduced to 8 per cent. The red cells varied at different times between 1,000,000 and 2,800,000. There was great enlargement of the spleen.

The man was first observed in 1895, and was seen again early in 1898. During this period the urine showed no abnormalities. In November, 1898, he was seen and stated that two weeks previously he had suddenly begun to pass large quantities of urine, and examination showed that it contained about 30 grains of sugar to the ounce. He disappeared, and the course of the case could not be followed. He had been improving up to the time the diabetic symptoms occurred. Arsenic had caused decided improvement in his condition, and his periods of depression of health were generally caused by overwork, exposure, or similar conditions. The occurrence of such a degree of glycosuria in such a case is, in Hare's opinion, unique.

TREATMENT. The treatment of the condition is well discussed by Sippy.² Considering the reports of previous cases, the treatment at first instituted should be rest in bed, care of the intestinal tract, and the administration of iron, arsenic, and other drugs; but surgical treatment must always be considered, and if the disease is, as it seems probable, primarily located in the spleen and due to changes in that organ, removal of the spleen would seem the most rational procedure. Sippy has gone over all the recorded cases of splenectomy, and has been able to find seven in which it was probable that the patients had splenic anæmia. In five of these seven the patients recovered entirely after removal of the spleen, while the other two died of hemorrhage. It is notable that in none of the seven cases was the operation performed early in the disease, and in at least two of the cases that recovered there was marked cachexia.

Considering the fatal course of the disease under other circumstances, one can only come to the conclusion that splenectomy should be performed as early as a positive diagnosis is made, since the mortality of

¹ Journal of American Medical Association, December 30, 1899.

² Loc. cit.

operation advances with the progress of the disease and the size of the spleen. Still, in one case that was cured the organ was reported to have been nearly eight times as large as normal, and hence the outlook even late in the disease is not hopeless if operation is undertaken.

This undoubtedly voices the opinion of most advanced authorities. While splenectomy is almost invariably fatal in leukæmia, it has not been followed by any unduly high mortality in splenic anaemia, and when the patient survives the operation, which, as Sippy's statistics show, is usually the case, great improvement generally follows. It is essential, however, to make very careful distinction between splenic anaemia and leukæmia before operating, as in leukæmic cases the result will almost certainly be fatal. This distinction is not usually difficult, but has not always been made by surgeons.

Purpura. That certain cases of purpura are due to infection cannot well be doubted, but the frequent occurrence of purpuric conditions with various forms of infection renders it very improbable that any one infection is solely or chiefly active in producing the symptoms in those cases that have such pronounced hemorrhagic symptoms; and that in others the infection is of relatively little moment in the clinical picture. The name *purpura* is a good general term; but it must be recognized as very probable that a variety of causes produces the same general clinical appearance, and while many of them are the result of infection, probably this is not always the case. The frequency of purpura with rheumatism and of a strong hemorrhagic tendency with other well-known infections, such as tuberculosis in its early stages, and typhoid, provides good presumptive evidence that infection is often active, however, and in more obscure cases, in which the condition seems to be an infection, micro-organisms have been repeatedly found.

J. H. Burch¹ reports such a case in a girl, aged fourteen years. An uncle had died of hemorrhage, and the girl herself had had severe epistaxis with purpura at the age of seven years. In September, 1896, she was seized with vomiting of blood following a severe chill and fever. Subsequently there were haematuria, bleeding from the mouth, jaundice, and epistaxis. The hemorrhages continued at intervals for a year, after which she improved; but five months later another attack occurred, and at this time the spleen became enlarged, the fever remained continuous, and the general condition suggested the appearances of typhoid fever, though the Widal reaction could not be obtained. This attack lasted for two or three weeks. The blood was greatly reduced by the frequent hemorrhages, and the red cells fell to 1,000,000 to the c.mm. The hemorrhage finally ceased, and the red cells are stated to have increased

¹ *Medical News*, April 8, 1899.

to 3,800,000 within the incredibly short period of two days. A bacillus of non-motile character, but otherwise suggesting the colon bacillus, was found in the blood and urine. It caused death in a rabbit within eight hours, with hemorrhagic extravasations into the subcutaneous and submucous tissues and a non-coagulable condition of the blood.

That there is a special infection in such cases seems very doubtful. If the evidence is not sufficient to prove that the bacillus isolated was the cause of the symptoms, and even were this settled positively, we must remember that purpuric symptoms sometimes occur in infectious diseases not commonly associated with such symptoms. As is well known, this is not uncommon in rheumatism, and it occurs frequently with terminal infections and less commonly in the midst of typhoid and other acute or chronic infectious processes. It is not known whether it is due to a special hemorrhagic tendency of the individual affected that leads to purpuric outbreaks, when others would escape such symptoms; whether it is the result of a secondary infection, or whether it bears no direct relation to infection, and is due to alterations in metabolism or other obscure causes.

In cases such as Burch's there is some probability that the subject was of hemorrhagic tendency, and that the reaction by hemorrhage to the infection, or whatever the cause may be, is due more to the constitution than to the nature of the cause. The child had some family history of hemorrhage and had had hemorrhages herself.

Cureton¹ observed a case of purpura in a boy, aged eleven years. The boy had fever and more or less prostration, and became very anaemic. The blood oozed from his gums, and the skin was covered with a general purpuric eruption. There was no rheumatic or haemophilic history. The boy died after twenty days. The blood became reduced very quickly a few days before death; the corpuscles numbering 1,680,000 three days before death and 310,000 on the day of death. Cultures from the heart's blood showed the presence of streptococci. There were numerous hemorrhages in the tissues, but no other notable lesions. The presence of the streptococci is of doubtful importance.

D. B. Lees² describes a case of violent acute rheumatism in which purpura appeared in the early part of the attack. The patient had previously had chorea and rheumatism. When admitted to the hospital she had grave dilatation of the heart, and soon after developed pericarditis; the purpuric eruption became very extensive, and large bullæ filled with a bloody serum developed in various regions, over the back particularly, where they broke down and left raw surfaces. Cultures were made from the blood, and streptococci were found, while the fluid

¹ Lancet, February 25, 1899.

² Ibid., October 28, 1899.

from the bullæ showed the staphylococcus. The blood showed no leucocytosis. Improvement occurred, and the purpura disappeared after two months, but there was rapid increase in the symptoms of cardiac failure about a month later, and the patient died.

The post-mortem examination showed adherent pericardium and dilatation of the heart, and slight thickening of the mitral, aortic, and tricuspid valves. There was no recent endocarditis. The heart-muscle was dark purple in color, and microscopical examination showed wide-spread fatty change, with some cellular exudate between the muscle bundles.

TREATMENT. Arcangeli¹ reports the use of subcutaneous injections of a solution of 2 per cent. of gelatin in normal salt solution in two cases of purpura hemorrhagica. The patients were girls, aged thirteen and ten years respectively. They had had repeated epistaxis and bleeding from the gums. The first case received two injections within twenty-four hours, each injection amounting to 20 c.c.m. The hemorrhage ceased entirely. A smaller amount sufficed in the second case to effect a cure.

The recent interest in the treatment of aneurism with gelatin injections has stimulated a number of workers to use gelatin in various conditions in which it is desired to increase the coagulability of the blood. The results are suggestive, but do not demonstrate any very decided effects.

Nervous Hemorrhages. William Pepper and A. E. Taylor² observed two very interesting cases of hemorrhages into the skin and from mucous surfaces, the result of nervous excitement. One case appeared in an hysterical woman who had been subject to hemorrhages during six years. There were frequent skin hemorrhages that were symmetrical, and bleeding from the mucous surfaces occurred now and then. The attacks were generally caused by nervous shocks. There were no definite signs of hysteria in the second patient, who was a woman, aged twenty-seven years, but fright and other nervous shocks were exciting causes of the hemorrhages. Severe ulcerative stomatitis had existed for months following the occurrence of submucous haematomata. Thyroid extract was very useful in this case, and the authors suggest that the result was perhaps due to the increased metabolism induced by the thyroid.

There is every reason to think that the hemorrhage in such cases depends upon some peculiarity of the individual's constitution, as is probably the case in many cases of hemorrhagic disease besides those conforming to the type called haemophilia, and the observation of the influence of thyroid treatment is of much interest in this connection.

Hæmophilia. The chief recent interest in relation to this affection has lain in the treatment. Heymann³ reports a case of protracted bleed-

¹ *La Semaine Méd.*, 1899.

² *Philadelphia Medical Journal*, May 6, 1899.

³ *Münchener medicinische Wochenschrift*, August 22, 1899.

ing following the removal of the tonsils in a patient with the characteristics of haemophilia. Heymann used 140 c.c. of a 2.5 per cent. neutral solution of gelatin in salt solution subcutaneously. The bleeding stopped, but recurred when the tampons were removed some days later, and 240 c.c. were injected again, and the next day 160 c.c. The bleeding ceased after this, and since other measures had been ineffective Heymann believes that the gelatin injections stopped the bleeding. A feature of the case which was of interest was the occurrence of subcutaneous emphysema of the neck and upper part of the trunk. Heymann considers this to have been due to entrance of air through wounds in the pharynx.

A similar but readier treatment was adopted by J. B. Nichols,¹ who describes the case of a man, aged twenty-four years, who had a family history of haemophilia, and who bled continuously from an incised wound of the wrist. The hemorrhage did not stop after the application of the tourniquet, and, since he seemed in great danger of death, gelatin was poured into the wound and the hemorrhage soon ceased.

In external hemorrhage this treatment is so easy of practice that it is certainly worthy of trial.

E. M. Sympson² found that the administration of bone-marrow is useful in the treatment of haemophilia, because of the effect upon the general condition and the appetite. He finds calcium chloride to be of use in controlling the tendency to bleeding.

Paroxysmal Hæmoglobinuria. The nature of this affection is so obscure that observations like that of P. S. Roy³ are interesting. He describes a case of paroxysmal hæmoglobinuria in a woman, aged sixty years, in which the difficulty appeared after the fatigue of sight-seeing. The woman had previously had Raynaud's disease, and directly after this attack had arthritis of the wrist and elbow. There is a suggestion of rheumatism in the case that indicates a possible relation to rheumatic purpura. It cannot be said, however, that there was a distinctly rheumatic attack.

DISORDERS OF METABOLISM.

DIABETES.

DEFINITION. The definition of diabetes is always a matter of difficulty, and, notwithstanding the material additions to our knowledge of the pathogenesis of the excretion of sugar, there are still marked

¹ Medical News, December 2, 1899.

² Lancet, May 13, 1899.

³ Philadelphia Medical Journal, September 2, 1899.

differences of opinion regarding the precise definition of the term diabetes.

Th. Funke¹ offers the following: Diabetes mellitus is a chronic disease in which considerable quantities of grape sugar ($C_6H_{12}O_6$) are continuously excreted with the urine. Subsequently he takes occasion to deny the existence of alimentary glycosuria, holding that the occasional appearance of sugar in the urine, just as the continual excretion of sugar, is dependent upon alterations of the metabolism. He thinks that every case of diabetes begins as an alimentary glycosuria in a certain sense, and believes that the whole difference is in the degree. If his previous definition of diabetes, as he distinguishes excretion of sugar, is to be accepted, temporary excretion of sugar is not the same disease, and this is precisely the view of those who distinguish between diabetes and glycosuria. The excretion of sugar may be dependent, according to the view of these, upon trivial causes such as excessive carbohydrate food, or may be the result of a severe disease of metabolism. The excretion of sugar is merely symptomatic; the underlying disease is very different in the two cases.

The statement of the author that he has experimented on himself and on friends to determine whether sugar is excreted after taking honey and champagne, and that he always found a negative result, is of interest only as far as his experiments are concerned. The work of a number of careful investigators might be cited to the contrary. Finally, with reference to the existence of sugar in the normal urine, he says that he has never been able to obtain positive reactions with Trommer's test, and that he had never applied the phenylhydrazin test, which Naunyn² had found positive in normal cases. He adds that this test is so delicate that even if small quantities of grape sugar are found with it, the amounts are so small that they need not be considered in practical relations. It has never been held by anyone that the normal urine contains large quantities of sugar, and it is difficult to see what view the author wishes to advocate when he practically admits that which he denies.

As far as our present knowledge goes, it must be admitted that small quantities of a carbohydrate reducing body, probably glucose, occur in the normal urine, and that under the influence of certain abnormalities of diet larger quantities may occur in the urine, more or less abundantly according to the individual constitution or to the nature of some existing disease, such as neuroses, liver disease, etc. These constitute cases of alimentary glycosuria. Finally, there are instances in which alimen-

¹ Die Heilung der Zuckerkrankheit., Hagen i., W., 1899.

² Der Diabetes Mellitus, Wien., 1898, A. Hölder.

tary glycosuria approaches in its seriousness to diabetes, and cases of diabetes, independent of alimentary influences, by which we would distinguish the cases in which sugar is produced from the other tissues. There are all forms of intermediate cases in which the alimentary influence is variously combined with the metabolic disturbances. No sharp line can be drawn between the groups of cases.

A. Mathieu and L. Mattan-Larrier¹ discuss the results of their experiments in the production of diabetes in animals and their observation of cases. They believe that they are able to state that glycosuria may occur as the result of over-production of glucose and from insufficiency of the kidneys, and that one may see an alimentary glycosuria and a diabetes which occur as the result of insufficient metabolism of sugar. They think that it is possible to produce diabetes through total extirpation of the pancreas, and the symptoms of this are entirely similar to those of human diabetes.

Human diabetes, however, is certainly not always due to this cause, for many patients have been found to have no affection of the pancreas when they had unmistakable diabetes. As a rule, when the pancreas is involved it is not entirely destroyed. Experiment has shown that total destruction of the pancreas is necessary to produce diabetes. Besides a disturbance of the function of the pancreas, it is necessary for the production of human diabetes to have other factors, such as reduction of the general vitality of the tissues, and particularly of the glycolytic function of the cells. In diabetes of the obese the chief factor seems to be a general nutritive disturbance, while in diabetes of thin subjects pancreatic disturbance is often the more important factor. In fat subjects Mathieu and Larrier consider that there are several stages. In the first the carbohydrates do not undergo proper metabolism and are formed into fat; a certain portion of the sugar is occasionally not so used and is excreted in the urine, owing to the ingestion of excess of sugar-producing substances. Finally, the glycosuria becomes permanent because of the reduction of the glycolytic function of the cells. If this function is excessively reduced we may see the occurrence of diabetes with emaciation, even though the pancreas is not involved; but if the pancreas is involved, diabetes with obesity readily becomes changed into diabetes with emaciation. If the pancreas is involved in the first place we have diabetes with emaciation. There may also be a combination of these two forms with varying prominence of the two elements.

PANCREATIC ORIGIN OF CASES OF DIABETES has been strongly advocated by R. Lépine,² who discusses the nature of the internal secretion of the pancreas. He believes that he has provided undoubted evidence

¹ *Gazette des Hôpitaux*, 1899, No. 129.

² *Lyon Médicale*, 1899, No. 16.

that the pancreas has a glycolytic function, and he believes that he now offers complete proof in the following experiment:

He placed pieces of pancreas in a bottle containing sugar, water, and yeast, and into another bottle introduced a piece of a pancreas, the nerves of which had been irritated with the faradic current. After some hours it was found that the second bottle contained less sugar than the first, and that the first contained less sugar than the control bottle, into which no pancreas had been introduced. Lépine observed, too, that after irritating the nerves of the pancreas with the faradic current the gland contained more peptone than previously, and decided, therefore, that the peptone either excites or increases the glycolytic activity of the pancreas. Hence, he concluded that it would be a wise therapeutic procedure to introduce subcutaneously non-toxic peptones in the treatment of diabetes. He has as yet been unable to carry out this plan because he has not been able to secure proper peptones.

THE SALIVARY GLANDS IN DIABETES. The relationship of the salivary glands to diabetes has suggested itself to a number of authors, who have made attempts to determine the nature of such a relation, and I have myself instituted some experiments in the way of determining whether alterations in the saliva existed in cases of diabetes. None of these studies, however, has given definite results. It is, of course, easily understood that the known relationship of pancreatic disease to diabetes would have suggested the possible connection of diseases of the salivary glands to the same disease.

Recently, F. H. Harris¹ has recorded a case in which diabetes developed in a man, aged forty-two, soon after his recovery from an attack of mumps. The author was induced to make certain experiments to determine if there were any relationship between the parotid and other salivary glands and diabetes. He removed the glands in a dog, and found that small quantities of sugar appeared in the urine for about ten days after the operation. He also refers to his discovery of slight pathological changes in the salivary glands in a man who died of tuberculosis complicating diabetes. These results, however, are not sufficiently striking to give any very strong support to the view suggested, though Harris refers to the fact that Reale was able to cause glycosuria in dogs by removing the salivary glands when previous removal of the pancreas had not been followed by the appearance of sugar in the urine.

Harris' patient, as stated, had had mumps. His history in this connection was that the attack of mumps had occurred three years previously. A month later he began to discharge more than the normal quantity of urine, and since that time the amount had slowly and

¹ Boston Medical and Surgical Journal, May 18, 1899.

steadily been increasing. Other symptoms were suggestive, such as the loss of patellar reflex, increase of appetite, etc. The urine contained 4.6 per cent. of sugar. The author suggests that there may be some direct connection between the disease of the gland and the occurrence of diabetes—a view that has been held by others; but it has also been suggested, and this suggestion is perhaps of greater importance, that the disease of the salivary gland induces a corresponding or coincidental disease of the pancreas, and that the diabetes depends upon the latter. Harris refers to the possibility of pancreatic disease occurring in mumps, and in particular recalls an observation of Schmack-pfeffer. He throws some doubt on the nature of the case in question, however, and states that he has been unable to find any case of pancreatitis presumably dependent upon mumps; but the occurrence of other glandular complications in the course of mumps justifies him in assuming that pancreatitis may be a not infrequent one, and it is possible that slight changes might be set on foot at the time of the acute attack, which subsequently persist as a chronic disease of the gland.

That the salivary glands may play some part in the pathology of diabetes is suggested by observations on changes in the saliva in diabetes, though it cannot be claimed that the rôle of the salivary glands is as important as some authors have been led to believe. Pathological changes, however, may be met with in these glands, and a case in point is referred to. A man, aged sixty-three years, was treated in the wards of the Philadelphia Hospital with well-marked diabetes. Five weeks before his admission to the hospital a dark spot appeared on the inner side of the big toe, and subsequently a purulent discharge came from this spot, which was very painful. There were no other evidences of physical disease than this gangrenous toe. The patient was placed upon diabetic diet and the gangrene healed, but his general condition grew worse. The points of interest in the pathological report are the wide-spread atheroma of the bloodvessels, the condition of the lungs, small cavities containing pus-like material having been found, and small nodules which were at least in part tuberculous in character, and, finally, the condition of the glands. All of the salivary glands were removed and found smaller than normal. The pathological changes were the same in all, including the pancreas. There was marked, but irregular, thickening of the trabeculae, and more or less extensive destruction of the acini. The excretory ducts of the glands were necessarily more or less compressed and certainly much distorted. The small arteries were thickened. Comparing the size of the acini with the size of those in a normal individual, the author found that normally the average diameter in the parotid gland is from 20 to 25 mm., while in the case under discussion it was from 10 to 20 mm.

Positive conclusions cannot be drawn from such cases, though they are of interest. The number of known cases of atrophy of the salivary glands is large, while the association of this lesion with diabetic symptoms is rarely seen, so that while the salivary glands may be active in producing or intensifying diabetic symptoms, it is not probable that this is frequently the case; and that apparently complete loss of function of the salivary glands does not usually produce such symptoms is evidenced by the absence of changes in the urine and in the general health in xerostoma, as suggested last year in the same connection in discussing the work of Jardet and Nivière.

That mumps affects the pancreas is, of course, possible; but there is no good evidence that such is the case, and case-records certainly show no special tendency to glycosuria after mumps.

INTOXICATIONS CAUSING DIABETES. H. Leo¹ believes that diabetes is probably the result of the action of toxic substances which interfere with the glycolytic action of the tissues. Proceeding on such a theory, he administered the urine of diabetic subjects to dogs, with the thought that if the supposititious toxic substance really existed they would exert their effect upon the animals. He repeatedly caused marked glycosuria by administering urine per os; but this was not constant, so he tried the plan of introducing it into the peritoneal cavity. The urine was freed from urea in order that this might not cause confusion. Experiments of this character with twelve dogs, the urine being taken from six diabetic subjects, showed results apparently corresponding with the gravity of the diabetes in the subject furnishing the urine. When the urine from three mild cases was used the results were negative, but that from the other three cases, which were moderately severe, always caused a positive result, producing a secretion of from 2 to 3 per cent. of sugar.

Leo does not attempt to prove that these observations are at all conclusive. It is so well known that numerous toxic substances cause glycosuria that it is not at all surprising that some specimens of urine should do this, and positive results by no means indicate that diabetes is the result of intoxication. It first remains to be demonstrated that any substance producing diabetic symptoms occurs with some regularity in diabetes, and then it must be shown that urine from other persons does not with any frequency produce similar symptoms, before much can be hoped for from such lines of research. In many metabolic affections it seems probable that toxic substances are present in the body and produce the chief symptoms, and yet they have not been demonstrated satisfactorily, and particularly by methods such as the

¹ Deutsche medicinische Wochenschrift, October 26, 1899.

one used by Leo are we likely to reach only inconclusive or confusing results. The changes that occur in the urine itself as a result of bacterial activity are very likely to produce a high degree of toxicity, and even with the best technique the study of the urinary toxicity in general is probably subject to wide errors. Glycosuria might as readily result from infection produced in injecting the urine as from any supposititious specific toxic substance. The effect of injecting ordinary solutions into the peritoneal cavity also deserves consideration.

RELATIONSHIP OF THE LIVER TO DIABETES. H. Sachs¹ has made an extensive study of the importance of the liver in the assimilation of various forms of sugar. He gave dextrose, galactose, and levulose as examples of hexoses, and arabinose as an example of pentoses, administering them to normal frogs and to others whose livers had been removed. The result in general was that the extirpation of the liver caused no change in the tolerance for grape sugar, galactose, and arabinose, while the tolerance for levulose was very much decreased. Levulose was also administered in doses of 100 grammes to several patients with advanced disease of the liver, one of which was carcinoma, three others chronic interstitial hepatitis, the fifth cholelithiasis, and the sixth compression of the common bile duct by carcinoma of the pancreas; a seventh case with chronic interstitial hepatitis had glycosuria, and an eighth case had atrophic cirrhosis of the liver. It was found in these cases that the tolerance for levulose was very much reduced, while similar observations with grape sugar and cane sugar showed no reduction in tolerance. Sachs, therefore, decides that his experiments prove that the liver is of marked importance for the assimilation of levulose, but not for the assimilation of other sugars. When considered in connection with the fact that levulose is better borne than other sugars in diabetes, these experiments seem to him to be important proof that the liver has very little relation to diabetes.

There can be little question, however, that the liver has important relations to glycosuria. Experiments upon animals are not sufficient of themselves to disprove what are well-grounded clinical facts.

N. Patton² has made some investigations concerning the manner of conversion of glycogen to glucose in the liver. Bial has shown that the liver and other organs after treatment with alcohol contain a diastatic ferment. Patton has investigated the question as to whether the liver after treatment with alcohol has more diastatic power than the blood and other organs. This is not the case. Since the diastatic power of the liver after treatment with alcohol stands in no relation to the effect of the fresh liver immediately after death, and since also it was found

¹ Zeitschrift für klinische Medicin, Band xxxviii., Heft 1, 2, 3.

² Journal of Physiology, 1899, p. 36.

that chloroform increased amyloyisis in the fresh liver, while alcohol rather decreased it, one is justified in saying that ferments play a relatively small part in the diastatic action of the liver.

E. Cavazzani¹ has shown that the livers of dogs that have received quinine intravenously produce much less sugar than the livers of dogs that have not received quinine. Quinine has scarcely any effect upon the action of ferments, but interferes with the activity of the cells, so that Cavazzani decided that the sugar production in the liver was a specific action of the liver cells.

C. R. Cohn² considers the question of the production of sugar from albumin. One of the most important products of albumin is leucin, and this closely resembles grape sugar. It seemed probable that leucin might form sugar in the body. Cohn, therefore, gave leucin to starved animals and then determined the amount of glycogen in the liver. He found that in such cases the liver contained distinctly more glycogen than was found in the livers of animals not thus treated.

THE RELATIONSHIP OF RENAL DISEASE AND DIABETES. P. F. Richter³ discusses the question of the existence of renal diabetes. He states that he has been able to find in the literature only one case in which it seems very probable that the glycosuria was of renal origin. This was the case of Kolisch and Buber, in which there was a large increase of sugar in the blood, and in which, therefore, it seemed probable that the kidneys allowed the sugar in the blood to pass through them, even though there was no hyperglycaemia. Richter has been able to produce a glycosuria by making intravenous injections of corrosive sublimate. This, however, he believes is due to the action of the poison upon the liver, because he found that at the time of the glycosuria the amount of sugar in the blood was very largely increased above the normal. He has never been able to cause glycosuria with chromium nor with oxalic acid and its derivatives.

Richter has also recently experimented with cantharidin in poisonous doses. This causes albuminuria, and certainly damages the kidneys. It also causes glycosuria if excessively large doses are not given. The fact that others have not been uniformly successful in producing a glycosuria with cantharidin he attributes to their use of too large doses. He injected 0.0005 gramme. A very decided glycosuria was produced, while there was at the same time a slight increase in the amount of sugar in the blood. He thinks it probable that the damaged kidneys in these cases allowed the passage of the sugar into the urine when normal kidneys would not have done so, for the hyperglycaemia was of

¹ Archiv für Anatomie und Physiologie (Physiol. Abth.), 1899, Supplement 1.

² Zeitschrift für Physiologie Chem., 1899, xxviii., p. 211.

³ Deutsche medicinische Wochenschrift, 1899, No. 51.

such a slight grade that there would certainly commonly have been no glycosuria as a result. The post-mortem examination of the kidneys showed marked changes which particularly affected the vessels in the Bowman capsules and other capillaries; the epithelium of the capsules was scarcely affected at all. He does not feel able to state the exact relation between the anatomical changes seen and the glycosuria; it has been repeatedly noticed that disease of the kidneys may be antagonistic to glycosuria, and, therefore, it would be rash to make too positive statements from the results of these experiments.

These experiments give evidence of the existence of renal diabetes that approaches much more closely to positive proof than anything that has previously been done. While there is as yet no definite proof as to the origin of diabetes in disease of the kidneys, there are a number of cases, such as the following, which make one incline to a belief in this. Eger¹ reports two cases which he considers of some importance in relation to the question of the existence of diabetes of renal origin. In both instances there was the history of the existence of chronic nephritis for years, and the patients were believed to have had nephritis for a long time before the symptoms of diabetes appeared; then glycosuria developed, and following it the symptoms of diabetes. Eger admits, however, that the importance of his observation is not very great, because he was unable to carry out estimations of the amount of sugar in the blood. There might have been a marked hyperglycæmia, which would render the observations useless as proof that the cases were really renal diabetes.

THE RELATIONSHIP OF NERVOUS DISEASES AND DIABETES. It is difficult to determine whether the existence of glycosuria in certain cases in which lesions of the central nervous system are found is dependent upon the lesions discovered or upon the other and perhaps entirely independent conditions; thus in the case reported by R. B. H. Gradwohl,² in which a man, aged forty-six years, who had sudden apoplexy, presented for a time 3 per cent. of sugar in his urine, which vanished after a few hours, the glycosuria was ascribed to the pressure of the blood-clot. Little was known of the case, and the previous conditions are not referred to in the report, so that it is difficult to draw proper conclusions.

Another case of the same sort is that of Gudden,³ in which the symptoms of diabetes developed after fracture of the skull.

THE RELATIONSHIP OF DISEASE OF THE FEMALE GENERATIVE ORGANS TO DIABETES. An association between gynecological condi-

¹ Deutsche medicinische Wochenschrift, 1899, No. 51.

² Philadelphia Medical Journal, April 22, 1899.

³ Friedreich's Blätter, 1899, Heft 1.

tions and diabetes has repeatedly been noted. H. D. Beyea¹ reports an interesting case of multilocular pseudomucinous cystadenoma of the right ovary, in which there occurred typical symptoms of diabetes that disappeared entirely after the removal of the tumor. The patient was a woman, aged fifty-three years, whose illness had begun with abdominal pain and severe uterine hemorrhages. These had continued and had been accompanied by the development of a tumor in the abdomen; the woman had some digestive disturbances and had a large appetite, but her food did not seem to nourish her properly. She noticed that she had become excessively thirsty and that she was passing urine in excess. Her general condition had grown gradually worse; the urine was found to contain a large amount of sugar and had a specific gravity of 1042; casts and albumin were absent. Operation was undertaken because of the gravity of the case, in spite of the anticipated danger from the diabetes. The tumor was found to have the usual characteristics of multilocular pseudomucinous cystadenoma, and weighed twenty-two pounds. Entirely unexpectedly the amount of sugar in the urine diminished rapidly after the operation, and when she left the hospital, less than a month after the removal of the tumor, she had but 4 per cent. of sugar in the urine, and all of her other diabetic symptoms were decidedly improved. About two months later the urine contained only 0.5 per cent. of sugar, and she was improving greatly; in about six months after the operation the sugar had entirely disappeared from the urine and all her diabetic symptoms had vanished.

A few other cases resembling this are abstracted by Beyea, and he considers the relationship of the diabetes to the tumor. He did not consider that the tumor was of sufficient size to make it possible that it had interfered with the function of the pancreas and had disturbed any possible glycolytic action of this gland, nor did he think that it could have caused marked hyperæmia of the liver and have thus given rise to glycosuria. The suggestion that he makes is that since the contents of this tumor is pseudomucin, which is a glycoprotein, it is not impossible that there may have been some absorption of this glycoprotein and excretion of the carbohydrate portion of it as sugar, together with the occurrence of the symptoms of diabetes. There are instances reported, however, of the occurrence of diabetic symptoms with disease of the female generative organs other than pseudomucinous cyst formation, hence this theory is not without flaws.

Beyea concludes that it is certainly established that in rare instances diabetic symptoms and glycosuria seem to be dependent upon disease of the genital organs, and in other cases marked glycosuria without

¹ Philadelphia Medical Journal, January 27, 1900.

diabetic symptoms seems to have the same dependence. Since these cases are rare, and this occurrence is not seen in every case of any class, he believes that some special predisposing condition of the body, or some other lesions, must be present in order to produce these symptoms. Cases of this kind and climacteric diabetes seem to have been cured in some instances by the removal of the local disease and the artificial production of the climacterium or by the occurrence of the normal climacterium.

LIPIDEMIA IN DIABETES. T. B. Futcher¹ reports the occurrence of lipaemia in a case of diabetes mellitus in a man, aged thirty-five years. The man had been excessive in the use of tobacco and alcohol, and had had purulent otitis media. His diabetes was of comparatively recent development. He presented typical diabetic symptoms, with excessive polyuria, the amount of urine upon one occasion being as much as two gallons in twenty-four hours. The condition of the blood was of interest, the fresh blood presenting great numbers of refractile granules of variable size, the largest being about 2 microns in diameter, the smallest about one-quarter this size. They had decided Brownian movement, and resembled bacteria. Centrifugalizing the blood showed that the serum was turbid and milky. Some time later the serum was seen to contain large numbers of the refractile granules and of droplets also, which were often clumped together and which took a faint blackish stain with 1 per cent. osmic acid; in part they showed also a red reaction with Sudan III. A great many of them took merely a yellow stain.

A month later the man had improved greatly, the sugar had disappeared from his urine, and blood examination showed that the granules were greatly reduced in number, and that there were no more of them than are seen in normal blood.

ACUTE DIABETES. H. L. Elsner² discusses acute diabetes. In twenty years' experience he has seen but three cases, two of them in children. In the case of the first child there had been an injury to the head a few weeks before the onset of symptoms. The first sign was extreme thirst, followed by polyuria and mellituria. The child died in coma a few days after the discovery of the sugar. The second child had no history of injury, but developed signs of diabetes, and died on the ninth day in coma. Neither child had any family history which seemed of etiological importance.

The third case occurred in an adult, aged thirty-five years, whose previous history was of no moment. He was exposed to wet weather,

¹ Journal of American Medical Association, October 21, 1899.

² Philadelphia Medical Journal, August 19, 1899.

and subsequently had dysuria, with dribbling and incontinence of urine, followed by hiccough. He became somnolent within three days, and his breath had a sweet odor. His pupils were contracted, and when seen there was an enormous abdominal tumor, which proved to be a distended bladder. The urine at that time contained large amounts of sugar. He died within a week after the beginning of his illness. During the last day of his life over a quart of urine was removed from the bladder by catheter every two hours. He died of exhaustion. Elsner also records the case of a man, aged thirty-four years, who was syphilitic and alcoholic and showed glycosuria shortly before his death from a cerebral hemorrhage.

E. J. Blackett¹ describes a case of acute diabetes mellitus which supervened upon diabetes insipidus, the patient dying in coma. The man was fifty-four years of age, and showed signs of diabetes insipidus after excessive exertion at a fire; he had sudden, marked thirst and polyuria, with debility. The urine was repeatedly examined and always had a low specific gravity and contained no sugar. About seven months after the appearance of these conditions, however, he over-exerted himself for some days and afterward experienced profound weakness and lassitude. Some weeks later he vomited repeatedly, was suddenly quite severely prostrated, and the next day was slightly comatose. The urine at this time was found to contain a considerable quantity of sugar and to have a specific gravity of 1026. The coma continued and deepened, and the man died after thirty-six hours of coma. Worry and shock were considered to have been the cause of his diabetes.

DIABETES IN CHILDHOOD. The recognition of diabetes mellitus in childhood is fairly frequent, though the number of accurately reported cases is still comparatively small, considering the very great frequency of this disease. One of the first, if not the first case recorded, was that of Mott, published in 1813, and after this several others were observed in England. The rarity of cases may be judged of by the fact that in 1872, Senator specifically declared the disease to be a very unusual one, and another author at the same time stated that some of the most experienced clinicians had not had the opportunity to observe a single case.

In 1878, Kulz referred to 111 cases in his article in Gerhardt's *Handbook of Children's Diseases*. In 1890, Stern collected 90 additional cases from the literature. A number of other compilations of the literature have been published, and one of particular interest is that of Wegeli, who collected 102 cases from the literature and added 28 cases not previously recorded. More recently S. Bogoraz² has collected

¹ *Lancet*, November 25, 1899.

² *Zur Kenntniss der Zuckerkrankheit im Kindesalter*. Inaugural Dissertation, Berlin, 1899.

36 new cases from the literature and has added 15 which he observed in the hospitals of Berlin. A case of some interest is the first in his own list, that of a child, one and a quarter years old, of a healthy family, which at the age of two years had had measles lasting four days, at which time the urine was free of sugar. Ten days after the measles pneumonia set in, and the urine again was free of sugar. After this furunculosis gradually developed and spread over the whole body. Previous to the measles the child had been nursed at the breast; after the illnesses referred to potatoes, soups, etc., were given, and occasionally chocolate, bread, and milk. At the age of six months the child fell out of bed, striking its head, and it was further noted that during the furunculosis there was rapid emaciation. The child was greatly depressed and passed its urine and bowel evacuations involuntarily. After a strict milk diet the urine showed 0.19 per cent. of glucose, which was carefully distinguished from milk sugar. There was no acetone or diacetic acid. From September 11th to September 20th sugar was constantly present in the urine, but after September 20th the sugar disappeared, and subsequently the child improved in every way, showing no further signs of diabetes. The case is one which justifies the author's opinion that the temporary appearance of sugar in the urine does not justify the diagnosis of diabetes. The definition of diabetes as a disease in which glucose occurs in the urine during periods of weeks, months, or years, as von Noorden teaches, does not, therefore, apply to childhood, at which period, according to the view of Monti, in which I share, occasional appearances of sugar in the urine is not infrequent.

Referring to the frequency of the disease, which I have already alluded to, the author adds that, as far as he could determine from the literature, there are about 500 cases recorded. It must be observed, of course, that not every case is recorded; moreover, all cases are not recognized. He does not include 388 cases reported by Dickenson and 308 by Roberts, because it is not stated in the reports of these authors how frequently the disease was diabetes mellitus and how often diabetes insipidus. The age of the occurrence of the disease may be judged of by a combination of the reports of Saundby, Kulz, Stern and Wegeli. These show that there were 13 cases under one year; 92 cases from one year to five years; 147 cases from five to ten years, and 234 cases from ten to fifteen years. There were 233 girls and 207 boys. The recognition of the disease in nursing infants is, of course, a matter of very great difficulty, and some authors, as Monti, doubt the possibility of diagnosing the disease at this time or even its possible occurrence at this age. Some apparently certain cases, however, have been reported, as Borgoras points out.

Referring to the matter of sex, he shows that in the cases collected

by him from the literature 14 were in boys and 17 in girls ; the sex was not stated in the other cases. Of the new cases reported by him 9 were girls and 6 were boys. The matter of heredity is one of great importance, and he found in the previously collected cases in the literature fifty-nine instances in which an hereditary tendency was observed. In his cases collected from the literature the same was noted four times, while three of the new cases reported by him gave an hereditary history. It is probable that the influence of heredity is even greater than these figures would indicate.

The diagnosis of diabetes in childhood is difficult ; in the first place, on account of the inability to secure large quantities of urine, and in the second place, in nursing children, it is necessary to bear in mind that the mere presence of a reducing body does not certainly indicate the existence of glucose, as other reducing bodies are met with in the urine, especially milk sugar, according to the investigations of Gross. In later childhood the diagnosis of the disease does not differ from that of diabetes in adults. The symptomatology does not differ materially either. The author refers to two stages : that of latent symptoms and that of acute symptoms, or the terminal stage ; the first may last for weeks or months without any indications of the disease at all ; the second stage starts in without any apparent cause, sometimes after a traumatism or some intercurrent disease, and the severity of the symptoms has sometimes led to such expressions as "the severe form of glycosuria in young people."

It is of interest to note that complications are less frequent in childhood than in adults, as von Noorden pointed out. Tuberculosis occurs now and then, but is, upon the whole, infrequent. Pneumonia is seemingly rare, coma is the common method of termination, and probably 30 per cent. of the cases reported in the literature perished in this way. Of the fifteen cases reported by Bogoras six died in coma.

Regarding prognosis, there is little to distinguish the disease from that of adults. Among 500 cases referred to in the literature 30 are reported as having been cured.

There is nothing particularly important in the studies of the metabolism in diabetes in childhood. The excretion of sugar is independent of the diet as far as the presence of carbohydrates is concerned. In two of Bogoras' cases it was noted that the nitrogen balance remained the same whether there was much or little excretion of sugar ; the latter apparently having no connection. He believes from these studies that the use of carbohydrates in the diet is only partly responsible for the excretion of sugar. The other portion of the sugar has a different source, and it is concluded that this source is the fats of the body, and not the albumins.

J. H. Sequira¹ records the case of a child, aged three years, which during the course of diabetes had an attack of jaundice. In this attack the mellituria disappeared almost entirely. The child's life was cut short by an attack of diphtheria, and there was no chance to determine the permanency of the apparent cure. The course of the disease in the young is so likely to be unfavorable that this case is very striking.

SYMPTOMS. There is a great tendency, seen frequently, to call all cases of glycosuria diabetes, and this seems to be exhibited in the case of W. Camerer, Jr.,² who describes what he calls a case of anomaly of the bladder associated with diabetes. The man was an alcoholic, fifty-nine years of age, who suddenly, without previous symptoms of bladder trouble, had absolute retention of urine. It was almost impossible to introduce a catheter, and only a small amount of urine was obtained. Subsequently he had to be catheterized regularly, and extremely large quantities of urine were obtained. Later, catheterization was left to his wife, and after five days he had a purulent urethral discharge, and shortly afterward an epididymitis. It became difficult to pass the catheter, and no urine was obtained, and later it was found necessary to puncture the bladder and empty it by aspiration. The man's general condition became grave, and he soon died in collapse. The post-mortem examination showed cirrhosis of the liver, with enlargement of the spleen and cloudy swelling of the kidneys. There was found a diverticulum of the bladder, separated from the true bladder by a valve-like flap, where the greater portion of the urine had collected. The urine was examined after death only, and was found to contain a large amount of sugar. Camerer believes that there was a sudden polyuria produced by diabetes, which over-filled the diverticulum and caused such pressure on the valve-like opening into the bladder as to obstruct the flow. He suggests that the symptoms in the last few days of life were due to diabetic coma. The explanation seems very unsatisfactory, and the report is not sufficiently complete to convince one that all of the symptoms toward the end were not due to sepsis.

The Blood in Diabetes. The study of the blood in diabetes has occupied a good deal of attention, and certain conclusions of practical value have been reached. The thesis of A. Bellemanière³ presents the literature and the development of this subject in a full and satisfactory manner. The author reaches the following conclusions: (1) The density of the blood is increased and the alkalinity diminished; in diabetic coma it becomes acid. (2) The red corpuscles present the peculiar reaction

¹ Lancet, July 15, 1899.

² Würtemberg medicinische Corr. Blatt, 1899, No. 5.

³ Thèse de Paris, 1899.

described by Bremer, which consists in a loss of the acidophile character and the requirement of the basiphile tendency. This reaction, however, does not occur solely in diabetes; it has been seen in other diseases. (3) The haemoblasts show nothing peculiar. (4) The white corpuscles present no reaction similar to that of the red, and the general behavior toward stains is the same as in normal blood. While there is a difference of opinion among authors as to the existence of glycogen in normal blood, all agree that white corpuscles present glycogenous granulations in diabetes. According to some recent work, however, it does not seem that excess of glycogen occurs in the blood in all diabetes. The number of white corpuscles does not suffer any peculiar change. It is interesting, however, to observe alterations in the kind of the leucocytes in consequence of certain terminal infections. (5) The sugar of the blood is glucose, as Claude Bernard shows, and there is a hyperglycæmia in diabetes and in the glycosurias. It is well to remember that certain authors have recently described reducing bodies other than glucose in the blood, and it has even been claimed that the normal blood, and even that in diabetes, contains less glucose than jecorin and albuminoid substance. Phloridzin diabetes is not accompanied by hyperglycæmia.

The milky appearance of the serum of the blood is generally attributed to numerous fine fatty granules. It still remains of interest to determine whether or not these granules are albuminoid in character. The utilization of the sugar in the organs is due to the action of a glycolytic ferment produced in the pancreas. In diabetes this ferment is present in reducing amount.

Nothing is known regarding the modification of other ferments.

In diabetic coma the blood loses its alkalinity, and it may contain products of incomplete combustion of glucose, namely, acetone, diacetic acid, or oxybutyric acid, none of which has been found to be constant. The serum of the blood is always more toxic in the termination stages of the periods of disease.

It will be observed that the author attempts without question, and repeats, the teaching of the French school of pathological physiologists. The theory of Lèpine regarding the glycolytic ferment, though most interesting and suggestive, still remains unproved. Any attempts to establish a comprehensive theory of the pathogenesis of the disease upon this foundation must meet with doubt, if not contradiction.

The reference to Bremer's blood-test must meet with approval. This reaction is interesting, perhaps at times suggestive, or even of diagnostic value, but it lacks the extreme importance which Bremer himself originally and lately has assigned to it. Further evidence that

it is not pathognomonic is furnished by C. Hartwig,¹ who found the reaction practically constant in cases of diabetes mellitus; but as it occurred in other conditions the value of the test is greatly lessened. He thinks that the cause is some alteration in the haemoglobin produced by the grape sugar.

Acetonuria. The origin of acetone has excited the same interest in the past year that has been seen for some time past, but conclusive results have not been reached. H. Lüthje² discusses the origin of acetone in acetonuria. Were it the result of acid intoxication, he considers it probable that strychnine injections and the resulting convulsions would result in acetonuria. This, however, was not the case in dogs poisoned with strychnine, nor was it found in epileptics after convulsions. Some authors consider that the acetone is produced in the intestine; but this, Lüthje thinks, is not true, since he administered calomel to produce intestinal antisepsis, and found that it did not influence the excretion of acetone.

C. Oppenheimer³ describes a new reagent for the detection of acetone in the urine. This he makes by adding 200 c.c. of concentrated sulphuric acid to 1 litre of distilled water, and subsequently adding 50 grammes of yellow oxide of mercury and allowing it to stand for twenty-four hours. The test is carried out by adding a few drops of this mixture to 3 c.c. of unfiltered urine; if the urine is albuminous there is a precipitate at once; if the urine is normal the precipitation occurs only after some time, and then the precipitate consists of uric acid, creatinin, etc. After adding enough of the reagent to make the precipitate become permanent, and after shaking, a few more drops of the reagent are added, the tube is stood aside for a few moments, and the contents then filtered; 2 c.c. more of the reagent are added to the filtrate and also 3 or 4 c.c. of the 30 per cent. solution of sulphuric acid, and the mixture is heated for a minute or two, preferably in boiling water. The occurrence of a thick white precipitate indicates acetone.

There are two fallacies in the test. The first is that if there is little acetone present there will be a precipitate only after the addition of a large excess of the reagent; and the second is the formation of a precipitate in urines that do not contain acetone, owing to reduction of the mercuric salt after the heating. This can be prevented by adding more of the 30 per cent. sulphuric acid solution. The test is said to be extremely delicate and very reliable. A reaction also occurs with diacetic acid. If the urine turns green after adding the reagent, and the filtrate is green, this indicates bile. In these cases no precipitate occurs upon

¹ Deutsche Archiv für klinische Medicin, Band lxii., Heft 3 and 4.

² Centralblatt für innere Medicin, 1899, No. 38.

³ Berliner klinische Wochenschrift, September 18, 1899.

warming. The test may be used for quantitative purposes also by taking a measured quantity of the urine, precipitating with the reagent, acidulating, and adding a large excess of the reagent and also about 2 c.c. of water. This is then placed in a strong bottle, tightly corked, and heated in a water-bath. The precipitate is collected on the filter, thoroughly washed until no longer acid, dried, and weighed. The weight multiplied by 0.055 indicates the amount of acetone present.

COMPLICATIONS. *Absence of Knee-jerk.* The knee-jerk in diabetes has been studied by numerous authors, and K. Grube¹ records thirty-two cases in which it was investigated. He divided the cases into the mild and severe forms, and states that the knee-jerk was absent in 49 per cent. of slight cases and in 24 per cent. of the severe cases. In eleven cases there was bilateral neuritis; in two of these cases the neuritis might have been due to alcohol, but in the others it seemed undoubtedly to be the result of the diabetes. The urine of a large proportion of these cases became free of sugar without any effect upon the neuritis being observed.

Grube has decided from his observations that sugar is usually present in a large amount when diabetic neuritis first appears, but that subsequently the neuritis is unaffected by the amount of sugar. The presence of excessive amounts of sugar in the blood seems to cause three kinds of nerve disturbance: very acute irritation, with cramp-like pains, neuritis, and slow degeneration of the nerves which usually affects the crural nerve and causes loss of the knee-jerk.

The infrequency of *involvement of the eye-muscles* makes reports of such conditions interesting. C. O. Hawthorne² describes a case of diabetes mellitus in a woman, aged thirty-seven years, in which there was complete paralysis of the external rectus muscle without any other paralysis. Since the paralysis was complete and isolated, Hawthorne attributed it to a peripheral neuritis. He also noted that there were white spots in one retina, with stellate lines radiating from the macula—a condition similar to that seen in chronic nephritis; while one retina was decidedly changed the other retina was normal. The alterations in the retina were not the result of nephritis, since albumin and casts were absent from the urine.

Mental Disturbances. R. Laudenheimer³ discusses the paralytic mental disturbances which result from diabetes—the so-called diabetic pseudo-paralyses. Actual paralysis with diabetes is rare, since Kaes found a combination but five times in investigating 1412 cases of paralysis. Laudenheimer reports three cases of diabetes associated with disturb-

¹ *Lancet*, July 22, 1899.

² *Lancet*, September 30, 1899.

³ *Archiv für Physiatrie*, Band xxix., Heft 2.

ances resembling paralysis. Two cases had a history of marked alcoholism, and in one of these, besides this, there was a brain tumor and a history of syphilis, while in the other there was apoplexy. The patient was sixty-five years of age, and the psychosis was, in general, of senile character. In the third case the diabetes seemed to be the sole factor in causing the mental change, which was of the character of paralytic dementia; the psychic disturbance was very greatly improved by the use of proper diet. Laudenheimer does not believe that it is yet proved that diabetes can cause true progressive paralysis of the insane. In rare cases there is a symptom-complex which resembles that of a paralytic dementia closely, and is evidently due to the diabetes, since proper diet will cause marked improvement.

Diabetic Gangrene. Recent records tend to show that diabetic gangrene is usually the result of arterial disease rather than of some more obscure cause associated with the altered metabolism.

C. S. Wallace¹ discusses diabetic gangrene, and states that the records of the St. Thomas Hospital for the past eleven years show twenty-six cases of diabetic gangrene. Examination of the arteries was made in 24 cases, and 23 of these showed decided atheroma. The patients averaged about sixty-three years of age. The proportion of males to females who have diabetes is usually considered to be about two to one, but many more males showed the complication of gangrene. Eleven cases were operated upon, 7 of which died; while of 13 treated by palliative measures, 8 died and 5 were unrelieved. Wallace does not think that it has yet been proved that gangrene occurs unassociated with arterial disease of a character likely of itself to produce gangrene in diabetic persons. He thinks that the best treatment is removal of the limb comparatively early, before sepsis has caused grave depression of the patient, and that glycosuria with gangrene may at times be looked upon as an indication rather than a contraindication for amputation.

Haemochromatosis. William Osler² reports two cases of hypertrophic cirrhosis of the liver with bronzing of the skin, or haemochromatosis. The first patient was forty-eight years of age, and had been moderately alcoholic. He showed much pigmentation of the skin about the nipples and the genitalia, with slight pigmentation of the general surface. The hands, wrists, and legs up to the knees were much bronzed, the mucous membranes were free. The patient had had for several years attacks of purpura and urticaria of the legs. The liver was much enlarged and was hard and firm, and there was marked enlargement of the spleen. Sugar and bile were absent from the urine, but indican was present in excess, and there was a distinct iron reaction. Excision of a portion

¹ Lancet, December 23, 1899.

² British Medical Journal, December 9, 1899.

of the skin of the legs showed characteristic ochre-colored pigment granules in the cells of the sweat-glands.

The second patient was a man, aged thirty-four years, who had had malaria and a continued fever of the tropics. He was not alcoholic. He had marked enlargement of the liver and spleen, particularly of the former, with increasing pigmentation of the face and hands. It was thought that he might have a tumor of the liver, and the abdomen was opened and showed an enlargement of the liver, with a somewhat irregular surface, the organ being of a deep brownish-red color. He improved temporarily, but died some five months later after about five years' illness. He had no evidences of diabetes.

Osler notes Opie's description of the origin of the disease. It consists first in a wide-spread deposit of iron-containing pigment, which secondarily causes degeneration and death of the cells and interstitial inflammation of the liver and pancreas, the latter ultimately causing diabetes, and thus leading to death. In the first cases reported by Osler he considers it possible that the preceding hemorrhages caused the deposition of the pigment.

H. W. Berg¹ records a case of bronzed diabetes in which there was a previous history of exophthalmic goitre, which had been nearly cured. Berg believes that the pigment causing the discoloration of the skin is derived from the haemoglobin; the haemoglobin is set free in the blood, he believes, by the sugar causing an increase in the fluids of the blood, the dilution being sufficient to dissolve out the haemoglobin. He attributes the cirrhosis of the liver found in this form of diabetes to the pigmentation, the pigment being believed to act as a chronic irritant. The fact that the patient had exophthalmic goitre first, and that this was followed by diabetes, indicates, he thinks, that the former disease is due to disturbance of the cervical sympathetic or the vagus, and that this disturbance extended to the abdominal sympathetic in this instance, and caused diabetes in this way.

Diabetic Coma. There has been increasing evidence that diabetic coma is due to intoxication with organic acids, and some additional proof is furnished by W. Sternberg,² who discusses the relation of various organic acids to diabetic coma and their importance in the etiology of this condition. The peculiar characteristics of the coma are the preliminary period of excitation, the subsequent development of profound coma, and a curious dyspnoea, with very deep respiration. The experiments which Sternberg reports are of much interest, since he was able by intravenous injections of about 3 grammes of β -amidobutyric

¹ Medical Record, December 16, 1899.

² Zeitschrift für klinische Medicin, Band xxxviii., Heft 1, 2, 3.

acid in cats to produce severe poisoning, with symptoms almost identical with those seen in man in diabetic coma. There was a period of excitation, followed by coma associated with a peculiar characteristic dyspnoea. α -amidobutyric and γ -amidobutyric acids were entirely without effect, and since β -amidobutyric acid is one of the very few substances capable of producing coma, Sternberg thinks that it is not improbable that this acid is active in producing diabetic coma, since we find acids of the β series in this condition. He does not feel able to speak positively, but does insist that there should be further study of β -amidobutyric acid and of the substances which reduce it in the laboratory in order to provide a possible method of useful treatment of diabetic coma.

L. Herzog¹ discusses the diagnosis of diabetic coma and insists upon the fact that all coma-like conditions seen in diabetes are not true diabetic coma. There may, of course, be distinct brain lesions which produce coma in the course of the disease, and as a result of diabetes there are several forms besides the peculiar form seen only in this disease. It may appear, for instance, as the result of cardiac weakness. There may also be a non-dyspnoeic diabetic coma and an abortive diabetic coma, or the true dyspnoeic diabetic coma, in which the most prominent symptom is the strikingly deep respiration. In the abortive form the disturbance is but slight, and it may belong to any of the three classes. There are also atypical forms which are the result of complications. There may, likewise, be a uræmic coma from complicating nephritis, and there may even be dyspnoeic forms of coma, not truly diabetic, resulting from severe nutritive disturbance, such as pernicious anaemia and carcinoma.

TREATMENT. New suggestions are being put forth yearly, and an ingenious one, though one that is scarcely built upon a sound basis, is that of Burghart,² who used *didymin* in the treatment of diabetes, largely because the disease is likely to affect the male sex and those who are obese, and because the subjects of this disease are likely to already be sufferers from impotence or to exhibit this symptom after the appearance of the disease. Burghart claims strikingly good results from this treatment in three elderly men, while he found it practically useless in young patients. Two of these older men showed continued good health some months after they had been discharged from the hospital. Good effects often seem to follow the most varied forms of treatment, and elderly persons especially often show a favorable course, so that the treatment suggested will not arouse much expectation of good results because of the lack of sound reasoning leading to its use.

¹ Berliner Klinik, June, 1899.

² Deutsche medicinische Wochenschrift, September 21, 1899.

The value of *salines and mineral waters* in the treatment of diabetes has long been recognized, and the number of cures attained in some of the watering-places has been very considerable. Th. Funke¹ refers to this subject, and especially to the method of treatment adopted by Vonduring, Lehmann and himself, in which the relations of mineral substances to the metabolism form the basis of the theory regarding the nature of the disease.

It is not unlikely that inadequate muscular exercise plays a certain part in the development of the disease, and as a natural deduction *muscular exercise* may be properly indicated as a measure of treatment. An interesting case showing the value of this element in treatment is one recorded by Albu,² in which a case of severe diabetes was converted into a mild one by persistent bicycle riding. When the exercise was given up recurrence of the condition resulted.

That simple care in *diet* and in the improvement of the *general health* are the most important factors can scarcely be doubted. Rare as cures are, they sometimes are seen. S. Wert³ records a case of diabetes, with apparent cure, in a man, aged forty-seven years, in whose family diabetes occurred and who himself had 8 per cent. of sugar in his urine, which had a specific gravity of 1030. He was put upon a strict diet and given some tonic remedies. The glycosuria disappeared within three weeks and remained absent up to a year after the disappearance.

Milk diet has been repeatedly recommended, but it has been conclusively shown that, as a rule, milk sugar is not much better borne than glucose, though contrary reports occasionally appear. W. Winternitz and A. Strasser⁴ give a preliminary report of their results from the use of strict milk diet. They found that it caused the sugar to decrease greatly or to disappear within forty-eight hours in all forms of diabetes, and even in cases that had resisted other treatment. If albuminuria had been present it usually decreased largely or disappeared. Acetone often appeared, or if it had been present previously it increased. If the milk diet was followed by mixed diet the sugar frequently reappeared, but vanished again after reinstitution of the milk diet. It is not at all certain that it is best to give vegetables and cereals after the milk diet instead of meats. They state that certain cases of diabetes are entirely cured by the use of milk diet. One case was observed for five months, and throughout the whole of this time was able to take large quantities of carbohydrates without any mellituria. The first effect upon the body-weight was a loss, but this was followed by a gain.

¹ Die Heilung der Zuckerkrankheit., Hagen i., W. 1899.

² Therap. Monatsschrift, 1899, p. 106.

³ Lancet, June 3, 1899.

⁴ Centralblatt für innere Medicin, November 11, 1899.

The ability to assimilate other forms of carbohydrates is considered no test of the ability to assimilate milk sugar.

In spite of the emphatic statements of the authors, it may be said that milk diet cannot usually be used with safety, and is likely to have the same effect upon the glycosuria and other symptoms as a diet containing the same amount of sugar in other forms.

Treatment of Diabetic Coma. There can be no doubt of the value of alkaline injections in the treatment of diabetic coma. We may recall in this connection the very encouraging result obtained by Oliver, to which reference was made last year.¹ Unfortunately, the results are only temporary, as a rule, and very frequently they are wholly unsatisfactory, from the fact, no doubt, that the treatment is instituted too late in the course of the disease. The result in Oliver's case was ultimately fatal: He adds a final report,² stating that the patient recovered entirely and remained in very good condition for 243 days; there was then another sudden onset of coma, and death occurred within two hours. Still, the treatment added the major portion of a year to the man's life, and this is sufficient encouragement.

L. Herzog³ reports two cases in which death occurred in spite of subcutaneous injections of salt solution and solution of sodium bicarbonate. In one case there was, as a matter of fact, some improvement, but this was only temporary. The author very properly remarks that the treatment, to be effective, should be instituted before coma develops, and in addition bicarbonate of soda should be given by the mouth.

GLYCOSURIA.

The question of the existence of physiological glycosuria occupies some attention. There can be no doubt that the normal urine frequently contains a carbohydrate of some sort, most likely glucose, though the amount of this is extremely small and its detection requires careful methods of examination.

J. Castaigne⁴ insists upon the importance of determining the condition of absorption from the digestive tract and the permeability of the kidneys in making tests of alimentary glycosuria. Alterations in gastrointestinal absorption and in the permeability of the kidneys disturb the results very greatly, and even positive results, he considers, may be due to functional disturbances as well as to anatomical changes in the liver.

¹ PROGRESSIVE MEDICINE, Vol. II., June, 1899.

² Lancet, August 26, 1899.

³ Berliner klinische Wochenschrift, April 3, 1899.

⁴ Gazette des Hôpitaux, 1899, No. 26.

The whole question of alimentary glycosuria is extremely obscure. It is usually a sign of insufficiency of the liver, but other signs must be used to control it before it can be considered of any great value.

T. Raphael,¹ in a study of alimentary glycosuria, administered grape sugar to certain patients, and at other times starches, and found that the former was much more likely to produce an excretion of sugar, but that there was little difference in the duration of the abnormal excretion. In cases in which diabetes had existed and in which alimentary glycosuria was not present after the administration of grape sugar the author believes the diabetes may be assumed to have been cured. It is worthy of note, however, that the excretion of sugar was not always proportional to the amount of carbohydrate administered.

These observations are of some interest in the prognosis of cases of diabetes. I have made it a rule in recent years to test cases of diabetes supposed to have been cured by this method, with the result that in some instances it has been found that alimentary glycosuria was absent excepting when excessive quantities of sugar were administered; in other cases the glycosuria was easily provoked.

ALIMENTARY GLYCOSURIA IN INFECTIOUS DISEASES. B. R. Bleiweis² reports the results of twenty experiments concerning the existence of alimentary glycosuria in acute infectious fevers. The patients investigated were in the course of *pneumonia*, *typhoid fever*, or *erysipelas*. In nine instances he found alimentary glycosuria after giving 100 grammes of grape sugar. In three instances the quantity of sugar excreted was remarkably high, there being respectively 6.5, 8.7, and 6.6 drachms in total amount; hence, there was evidently a very marked difference in these cases in the power of assimilating sugar. In consonance with other observers, he found that in pneumonia the alimentary glycosuria was found most frequently on the days near the crisis, and if present at other times was more marked about the time of the crisis. In two cases which showed very marked excretion of sugar he gave large test meals of starch, but was unable in this way to produce alimentary glycosuria.

Hibbard and Morrissey,³ after examining a large number of cases of *diphtheria*, decide that a transitory glycosuria is extremely common in severe cases. This lasts from one day to several weeks, and is often accompanied by an albuminuria, which appears about the same time. In fatal cases they were practically always able to determine that sugar was present. The urine in such cases usually reduced copper solutions and gave a reaction with phenylhydrazin.

¹ Zeitschrift für klinische Medicin, Band xxxvii., Heft 1 and 2.

² Centralblatt für innere Medicin, January 13, 1900.

³ Journal of Experimental Medicine, 1899, vol. iv.

THE EFFECT OF VARIOUS DRUGS IN PRODUCING ACTUAL GLYcosuria, or reactions with certain tests suggesting the presence of sugar, has long been known, and besides among other drugs are chloral, chloroform, morphine, and copaiba. An interesting instance of the last named was reported by Bettmann,¹ who found glycosuria in a young man, previously well, who had been taking excessive doses of copaiba. In addition to the alteration of the urine there was excessive appetite and thirst. The author, by experimenting in other cases, thinks that it is possible to produce alimentary glycosuria in individuals who receive the drug and in whom such glycosuria is not readily producible when the drug is not given.

K. Morishima,² in investigating the glycosuria following curarin poisoning, found that the appearance of sugar in the urine after this poison was not a regular occurrence. There was no definite difference to be seen between the action of curarin and protocurarin. The appearance of glycosuria in frogs had no definite relation to the amount of glycogen in the liver or in the muscles. In the beginning of the poisoning there was a marked decrease of the secretion of urine, which sometimes advanced to actual anuria. Later there was a marked polyuria, but the sugar excretion bore no definite relation to the polyuria. The glycosuria appeared even when the animals were kept in the cold. No glycosuria was seen in frogs that were poisoned for the second or third time when they had excreted sugar after a first poisoning. Morishima describes a convenient catheter which he used to obtain the urine from the frogs.

F. Raphael³ reports the occurrence of glycosuria after moderate atropine poisoning. The man was proved to be a ready subject for alimentary glycosuria. The amount of sugar found was 0.4 per cent., and the excretion on the first day was 1.8 grammie. The sugar proved to be dextrose. The glycosuria caused by atropine was not an alimentary glycosuria, since the man had taken no food for twelve hours before. Five guinea-pigs were given atropine, and in four of these glycosuria was produced. To some of them grape sugar was given, and it was to be considered, therefore, an alimentary glycosuria; but in others the grape sugar was not given, and the glycosuria was evidently due directly to the action of the atropine.

GLYcosuria IN PREGNANCY. J. Hofbauer⁴ tested the urine of forty-five pregnant women, in apparently normal condition, as to the presence or absence of glycosuria. He gave 100 grammes of grape

¹ Berliner klinische Wochenschrift, May 22, 1899.

² Archiv für Exper. Pathologie und Pharmakologie, Band xlii., S. 28.

³ Deutsche medizinische Wochenschrift, July 13, 1899.

⁴ Wiener klinische Rundschau, 1899, No. 1.

sugar in solution to each. In thirty-nine cases there was glycosuria as a result, and the amount of excretion increased with the duration of the pregnancy. In a number of pathological cases, as well as in some of abortion and of death of the fetus, the examination was negative. He believes, therefore, that alimentary glycosuria is normal in pregnancy, and its absence is sufficient to arouse a suspicion of some abnormality.

METHODS OF EXAMINING THE URINE. I. H. Coriat¹ has investigated the value of the phenylhydrazin test for sugar in the urine, with the special purpose of determining what other substance might give the reaction. Crystals of various sizes and shapes were found after testing solutions containing lactose, glucose, levulose, maltose, and saccharose. Glycogen and starch gave no crystal formation. A decided reaction was found in solutions of glucose in the strength of 1: 10,000.

The presence of albumin did not affect the reaction, and it was not produced by substances which are normally found in the urine, such as urea, uric acid, hippuric acid, and creatinin.

P. Mayer² discusses the secretion of glycouronic acid in the body and its occurrence in the urine. It is produced through oxidation of glucose, and is found in the urine united with other substances, such as chloral, camphor, turpentine, and phenol. Glycouronic acid does not ferment, but has marked reducing powers, and rotates polarized light to the right. The paired glycouronic acid compounds also reduce copper solution, but are levorotatory; they also do not ferment. Certain authors state that morphine appears in the urine in combination with glycouronic acid. Mayer recently examined the urine in a case of morphinism, and found acetone and diacetic acid and some substance which reduced Fehling's solution in a peculiar manner, the mixture remaining unchanged for some time during boiling, but suddenly showing precipitation of copper which occurred when the boiling had been continued for a minute or two. Such delayed reaction occurs with pentoses and paired glycouronic acids. This urine did not ferment, but was levorotatory. It gave Tollen's reaction, which occurs with both pentoses and paired glycouronic acids. It seemed probable that the substance was glycouronic acid, as pentoses are either dextrorotatory or do not rotate polarized light. Heating the levorotatory substance, which was isolated by adding dilute acids, caused the levorotation gradually to diminish and to be succeeded by dextrorotation, which one would expect if the paired glycouronic acid were converted into free glycouronic acid. Hence it seemed certain that the substance was glycouronic acid.

¹ Boston Medical and Surgical Journal, November 23, 1899.

² Berliner klinische Wochenschrift, July 3, 1899.

DIABETES INSIPIDUS.

Gerhardt,¹ of Strassburg, has written a very interesting article on diabetes insipidus, reviewing the subject from all points of view. To show its comparative infrequency, he cites the statistics of the Berlin Charité, where there were but 55 cases among the 113,600 patients treated from 1877 to 1896. Eichhorst saw but 7 cases among 35,942 cases treated at Zurich. Various authors agree that the disease is about twice as frequent in men as in women.

The author does not define the disease accurately, but states that it is certain that various conditions have been described under this title, and that in many cases the polyuria is but a symptom of another disease, while in some it is the only pathological condition. The terms primary and secondary, or essential and symptomatic, have been applied to designate these different forms. Another division of cases has been much employed, especially by French writers, accordingly as the water alone is increased or the solid constituents, especially the urea or the phosphates, of the urine as well, or as the urea is actually decreased in quantity. This classification originated with Willis, who distinguished hydruria, in which there is increase of water alone; azoturia, with increase of the water and the urea; and anazoturia, with increase of the water and decrease of the urea.

Gerhardt analyzes the symptoms of diabetes insipidus very carefully, and states that the amount of urine may exceed the amount of the liquid ingested, and frequently is very little less than the total amount of water taken into the body, not only in the form of drink, but as a part of the solid foods. The older statements that the amount of water usually exceeds the amount taken into the system are manifestly inaccurate. The amount of excretion of water through the skin and lungs is undoubtedly decreased in this disease, but it is certain that this excretion is not completely wanting.

Referring to Kraus' contention that the essential pathological condition in diabetes insipidus is a condition which he terms tachyuria, the author insists that this is certainly not an essential feature, and points to Strubell's studies in which healthy persons were found to be as distinctly tachyuric as those suffering from the disease. Most recent authors deny the possibility of a primary polydypsia, and the recent work of Strubell, showing the inspissation of the blood as a result of thirsting, is another support for this view. Still, there is some reason to believe that polydypsia is an important element in some instances, as

¹ *Der Diabetes Insipidus*, Vienna, 1899, from Nothnagel's *Specielle Pathologie und Therapie*, Bd. vii., theil 7.

is shown by the fact that the sudden or gradual decrease in the quantity of liquid has caused a disappearance of the symptoms of the disease in some instances. A number of cases are cited from the literature in this connection.

Buttersack is quoted in particular, and his criteria of a distinction of primary polydypsia from primary polyuria are referred to. Primary polydypsia is indicated by (1) normal sweat production; (2) a lesser excretion of urine than the amount of liquid taken as drink; (3) the cessation of polyuria, with discontinuance of the administration of water, and (4) the complete parallelism between the excretion of urine and the absorption of water throughout the different parts of the day.

While Gerhardt admits the existence of cases of primary polydypsia as an element in some cases, and primary polyuria in other cases, it is impossible to draw sharp lines, and only in the case of organic diseases of the brain does he believe that primary increase of polyuria is the sole pathological condition. While some authors have laid great stress upon the exact amount of sweating or excretion of water through the lungs, Gerhardt very properly points out that this may be purely secondary in consequence of the increased amount of urination.

Referring to the cases of so-called azoturia, the author points out that it has not as yet been shown that this is the result of increased destruction of nitrogenous elements, and not the result of the excessive appetite of the patient. In a few cases of the disease there have been strikingly low quantities of urea excreted, as, for example, in one of his own cases in a woman weighing 55 kilogrammes, who had a daily excretion of nitrogen during two weeks varying from 5.4 to 6.4. The ingestion of nitrogen was about equal to that excreted. Such remarkable decrease of nitrogen intake and output has thus far, according to him, never been observed except in cases of hysterical causation, or at least of a nervous form.

In one of his own cases the polyuria ceased rather quickly after isolation, and in another case after controlling the thirst of the patient. In neither of these cases was there any symptom of serious consequence as a result of the decrease in the amount of fluid drank. He admits that in these cases the disease was of an hysterical character, more of the nature of polydypsia than of polyuria. Still, in view of a published case of Geigel, such a distinction of the nature of a case must, he holds, be made with great care. In Geigel's case in the first few days after cessation of drinking there were marked disturbances—headache, vomiting, small pulse, etc.—but by perseverance in abstaining from liquid the condition rapidly improved, though the patient was not completely cured; the amount of urine fell from 12 to 17 litres per day to 4 to 6 litres.

Gerhardt, in referring to the etiology of diabetes insipidus, details a case that occurred in Naunyn's clinic, in a man, aged forty-three years, in whom the condition was due to a softening of the left cerebral hemisphere. The quantity of urine was from 12 to 16 litres per day, but fluctuated considerably and tended rather to grow less toward the end of life.

In discussing the relationship of hysteria to the disease he notes that among the five cases in Berlin, the five in Strassburg, and the four in Königsberg, of which he has notes, there were three in the first group, four in the second, and one in the third in which hysteria was present. Most authors place the percentage of hysterical cases at a much lower figure, and, as the author points out, the French writers still collect individual cases of hysterical polydypsia, regarding this form as comparatively rare. This may be explained by the assumption that so-called idiopathic cases really belong in the group of hysteria.

GOUT.

ETIOLOGY AND PATHOLOGY. There are constant additions to the evidence that variations in the amount of the end-products of nitrogenous compounds which are found in the urine are rather the evidences of changes in diet or of alterations in metabolism than indications of the cause of gout. C. F. Martin¹ discusses the relation existing between disease of the kidneys and the excretion of the alloxuric bodies. Much importance has been attributed to the theory of Kolisch, that the xanthin bases are the cause of gout and the uric acid diathesis. Kolisch believes that the uric acid is formed in the kidneys, and that disease of these organs will interfere with the formation of uric acid and cause an excessive production and elimination of xanthin bases. In the uric acid diathesis there is usually no disease of the kidneys, hence the uric acid and the xanthin bases are produced in relatively normal amounts, while in gout he believes that the kidneys become diseased and that the xanthin bases are formed in excess, owing to the inability on the part of the kidneys to convert the nucleinic acid derivative into uric acid in sufficient amounts. The proof of such a theory depends upon the demonstration that the excretion of uric acid is diminished in diseases of the kidneys and the amount of xanthin bases is increased. Kolisch's apparent demonstration of such a condition in several cases cannot be trusted, since he used the Krüger-Wulff method, which is entirely untrustworthy.

Martin has investigated seven cases of nephritis in this connection. The xanthin bases in six cases varied in daily amount from 13.6 to

¹ Philadelphia Medical Journal, December 23, 1899.

47 mg., and the average daily amount in the different cases varied from 17.2 to 36.7 mg. There was, therefore, no increase of the xanthin bases. The uric acid varied from 0.2 grammie to 0.567 grammie, the total average of six of the cases being 0.358 grammie. In two cases the ratio between the uric acid and the xanthin bases was increased at one time, and in one case the xanthin bases on one day reached the amount of 81.1 mg.—which was much more than the normal, and almost as much as the amount of uric acid excreted. In this case, however, only one examination could be made, and no conclusions are, therefore, justified. It was certain there was never in any case an actual predominance of the nitrogen of xanthin over that of the uric acid, such as Kolisch has reported, and the variations in amount cannot be considered of any marked importance because they occur in normal persons and are ill understood under any circumstances. Martin notes that in several cases the percentage of uric acid was high—another point against the theory of Kolisch that the production of uric acid is diminished in disease of the kidneys. He also notes that in two cases of intermittent albuminuria investigations of the amount of uric acid in the urine after resting, when the urine was almost entirely free from albumin, and after exercise, when albumin was present, showed that in the latter case there was much more uric acid than after the period of resting. It is to be presumed that after exercise, which produced albuminuria, the kidneys were in a less capable condition than after rest, when there was no albuminuria. Nevertheless, the uric acid increases after exercise—another evidence that damage to the kidneys does not decrease the excretion of uric acid. The work of A. E. Taylor, which will subsequently be referred to, shows very clearly the relation between the diet and the elimination of the purin bodies in health, and demonstrates that normally the amount excreted depends almost entirely upon the character of the food taken. It cannot, of course, be considered that this shows that an entire lack of relation between these bodies and gout, but it does show the faultiness of all investigations which do not take strict account of the diet. It may be stated very positively that Kolisch's results are valueless, because the method he used was worthless, and later investigations by Salkowski's method have not only failed to confirm Kolisch's results, but have all tended to show that they were erroneous. Martin's figures give strong added evidence against Kolisch's view, and there is at present every reason to believe that Salkowski was right in stating that results of clinical value cannot be expected from the study of the xanthin bases.

THE RELATION OF URIC ACID TO GOUT. In the study of uric acid in its relation to the production of the disease there has been the same growth of evidence that the disease itself is not due to uric acid, how-

ever important the latter may prove to be in the production of the local symptoms. There has been much question whether the neuroses found in the disease were primary to the deposition of uric acid or whether they are the effects of the deposits. This question, as well as the more general one of the importance of uric acid in causing the disease and the general relation to gout, has been considered by W. His, Jr., and his coworkers.¹ A previous paper dealt with the production and subsequent disappearance of gouty deposits, and will be referred to later. This communication concerns investigations of the uric acid in cases of gout under various circumstances. The excretion in gout did not average more than that in health, and was subject to very great variations. In acute attacks it was found that the excretion was less for from one to three days before the attack, and in the beginning of the attack it was reduced still further; it then increased rapidly, to reach its highest point after from one to five days. The average excretion during the attack and in the interval was about the same. Sodium bicarbonate and Faching water, as well as lemon juice, had no effect upon the excretion, while lithium carbonate decreased it. His considers that the acute attack consists in a deposition of uric acid or similar substances about the cartilages. This causes a reduction in the excretion for from one to three days. The deposits are then dissolved or taken up by the phagocytes and excreted, and there results an increase in the excretion.

Closely related to the excretion of uric acid is, of course, the amount contained in the blood and the degree of alkalinity of the blood. These points have been carefully investigated by A. Magnus-Levy,² who has made some interesting observations in thirty-six cases of gout seen in Berlin. He first insists that the disease is more common in Germany than has been believed, suggesting that it is probably often diagnosed as rheumatism. Cases of acute arthritis in persons above the age of forty years are almost surely gouty, he holds, when the attack is the primary one. This is an opinion which a number of clinicians have entertained in America as well. I have recently seen several instances strikingly corroborating the view. In his studies of the amount of uric acid in the blood Magnus-Levy found results directly the contrary of those obtained by Garrod, the amount being no larger during the attacks than in the intervals between the attacks. However, in some instances, as might also occur in normal individuals, there was a greater amount than the accepted average; this is true, too, of a number of other diseases. The alkalinity of the blood showed no regular

¹ Deutsche Archiv für klin. Med., Bd. lxxv., Heft 1 and 2.

² Zeitschrift für klinische Medicin, Band xxxvi., Heft 5 and 6.

fluctuation, and in the majority of the sixteen cases investigated the variation from the normal during the attack was very slight in this respect.

NITROGEN METABOLISM IN GOUT. The most important part of Levy's work, however, was his investigation of the metabolism. In some of the cases there was a marked nitrogen loss, in part the result of deficient nourishment from lack of appetite, though in part evidently due to some other cause, very likely an intoxication. After the cessation of the attack nitrogen retention was observed, just as is seen in cases of infectious fevers. The nitrogen losses were conspicuous only in cases in which there was involvement of a number of the joints, and in robust individuals. During most of the attacks there was excessive excretion of uric acid; but this was not true of all cases, being rather limited to those in which sufficient nourishment was taken by the patients and in whom there was no excessive loss of nitrogen. In a few cases he found a retention of uric acid before the attack, but the amount was never enough to explain the attacks, and did not correspond to the subsequent increase in the excretion. The investigation of the respiratory exchange of gases through the lungs showed normal conditions. The administration of sodium salicylate seemed to increase the elimination of uric acid, while the calcium salts decreased it.

A less extensive record comes from Zagari,¹ who reports the results of his metabolism work in a case of gout. Between the attacks there was a retention of nitrogen, resulting, he thinks, from the effort of the tissue to replace the nitrogen loss that occurred during the attack. He considers that the loss of nitrogen in the attack is still unexplained, but must be the result of the presence of substances in the body which cause increase in the activity of proteid destruction.

PHOSPHATE EXCRETION IN GOUT. W. Bain² determined the condition of phosphorous excretion, and decides from his investigations that if the patient is placed upon a fixed diet the excretion of phosphoric acid varies directly with the excretion of uric acid, and the alloxuric bases are not increased. He does not consider the methods of investigation sufficiently delicate to determine the presence of minute quantities of uric acid in the blood. Sodium salicylate increases the excretion of uric acid, as does thymus gland also.

C. Watson³ also reports some results from work relating to the metabolism and the condition of the blood in gout. His results concerning the phosphates differed from those of Bain. He made a special investigation of the excretion of urea, uric acid, and phosphates during the attack and in the interval, and determined the influence of changes

¹ *Il Policlinico*, March 31, 1899.

² *British Medical Journal*, October 28, 1899.

³ *Ibid.*, January 6, 1900.

in diet and of drugs, and at the same time investigated the number and character of the white blood-corpuseles. The excretion of phosphates was found very markedly diminished during the first three days of the attack. Subsequent to this there was a decided increase, and the ratio of the amount of phosphates and the amount of urea and uric acid was very different in the attack and in the interval. There seemed to be a retention of phosphates, or a change in metabolism, which resulted in diminished production of phosphates. The uric acid excretion increased very decidedly during the first three days of the attack, and the total nitrogen increased during this period also, but was more decidedly increased later, even though the patient was taking less nitrogen in his food. At this later period the uric acid was not proportionately increased. After the attack had passed the uric acid diminished as compared with the early days of the attack, hence the ratio of urea and uric acid became greater.

Myelocytes were found in the blood, both in the interval and during the attack, but in greatest number during the attack, and Watson thinks it possible that there may be a relation between the changes in the excretion of phosphates and in the presence of the myelocytes.

The use of sweetbreads caused some increase in the excretion of phosphates. The use of potassium iodide and sodium salicylate also caused a marked alteration in the excretion of the phosphates. Watson believes that the alkalinity of the blood is not diminished during the attack of gout, and that the excretion of uric acid is rather increased than diminished, and also that the amount of uric acid in the blood is not greater during the attack. Hence it is evident that uric acid does not seem to be the direct cause of the acute attack, and Watson insists that too much attention has been given to the exclusive study of uric acid, and that other substances should be investigated, particularly, if possible, the condition of the bone-marrow.

GOUTY DEPOSITS AND NECROSIS. The local lesions and their cause and effects were studied by W. His, Jr.,¹ and his coworkers. The report concerns the results of injection of suspensions of acid sodium urate. The symptoms produced were very similar to those of gout, but not exactly the same. The injections caused a cellular collection and a subsequent necrosis, the necrosis extending far beyond the limits of the deposits of crystals. This makes Ebstein's theory that the necrosis is primary and the uric acid deposit secondary very improbable. Deposits similar to tophi were produced by subcutaneous injection, but injections about the joints did not cause deposits in the cartilages, though the symptoms were quite similar to those of an attack of

¹ Verhandl. d. XVII. Congress für innere Medicin, 1899.

gout. The uric acid deposit was removed both by phagocytosis and by undergoing solution.

M. Freundweiler's¹ work had previously given a portion of these results. He reports some experimental investigations concerning gouty deposits, particularly discussing the question as to whether deposits of uric acid cause inflammation and necrosis. He injected suspensions of biurate of sodium into rabbits, and as a control injected calcium carbonate. He found that about the deposits of the urates, which collected in masses, there were necrotic areas surrounded by a connective tissue capsule, and about this there was an inflammatory infiltration. The appearances were entirely similar to those in gouty nodules. About the deposits of calcium these changes were much less marked, and occurred later. Freundweiler believes, therefore, that the action of the urates is specific. He found that the gouty nodules disappeared largely through phagocytosis, though there were perhaps some solution through the tissue juices also. He thinks that phagocytosis is chiefly active in the solution of actual gouty deposits. Attempts to alter the alkalinity of the blood, and thus to influence the absorption of the artificial deposits, were unsuccessful. Freundweiler injected in two places in his own arm suspensions of the biurate. There was marked inflammation about the injections after six days. On the twenty-fourth day one area was incised; it corresponded entirely with the conditions seen in the animals. From the twenty-fifth day he took Faching water, Wiesbaden gout-water, and a mixture containing phosphoric acid, but the gouty deposits showed no change.

This work is of importance in showing that the deposit of uric acid is probably primary and the inflammatory and necrotic changes secondary.

EFFECT OF VARIOUS DIETS ON THE EXCRETION OF THE PURIN BODIES. A. E. Taylor² investigated in his own person the influence of various diets upon the elimination of the urinary nitrogen, urea, uric acid, and the purin bases. The diets investigated consisted of normal diet, with the exclusion of foods containing large quantities of nuclein, next a diet of sweetbreads, after this a diet almost exclusively composed of beef-steak, then a vegetable diet, following this a milk diet, and then one composed of sago, sugar, and butter from which nitrogen was almost absent. In each period after the diets had been used for three days the urine was collected, and was estimated for six successive days. The uric acid was lowest with the normal diet and milk diet; it was higher with the vegetable diet than with the pure proteid diet, owing apparently to the large amount of nuclein contained in the vegetables, it was

¹ Deutsche Archiv für klinische Medicin, Band Ixiii., Heft 3 and 4.

² American Journal of the Medical Sciences, August, 1899.

very excessive with the sweetbread diet; it increased with the normal diet upon the use of coffee and beer; it was not increased with the use of large amounts of meat, evidently because meat contains little nuclein. The uric acid urea ratio was found to be wholly different from that given by Haig. Haig's gout ratio was present when no proteid was taken, and the more proteid ingested the further did the ratio differ from Haig's. The elimination of the xanthin bases with the different diets seemed to indicate, as Krüger and Salamon state, that only one-third of these bodies is formed by metabolism, while the remaining two-thirds are derived from the food. The ratio between the uric acid and the purin bases showed nothing of clinical importance, and the purin bases bore relatively about the same relation to the total nitrogen as did the uric acid. The elimination of the nuclein derivatives and the excretion of the total nitrogen are evidently entirely distinct, and must be studied separately, the character of the diet rather than its quantity evidently being the chief factor in causing increase or decrease in any of these.

This work is the most important that has been done in this question.

The relation of uric acid to the diet was fairly well known before, but Taylor's work makes this clearer and establishes for the first time a similar relation between variations in the diet and in the amount of these bodies excreted. This shows how useless it is to undertake work on the xanthin bases or uric acid without a careful regulation of the diet. It also indicates that some of the apparent reduction in uric acid excretion during the early stages of an attack of gout is perhaps due to the patient's taking less food during the stage of acute suffering.

W. J. S. Jerome¹ provides new material in proof of the origin of uric acid from nuclein compounds and derivatives. It has been already determined that the use of thymus gland largely increases the uric acid excretion. Jerome found that the same took place after the use of Liebig's extract of meat. He digested a calf's thymus with pepsin and hydrochloric acid, and found alloxur bases in the fluid. Since the nucleins are not digested in gastric juice the alloxur bases seemed necessarily to come from the albumin component of the nucleo-albumin, and this, to his mind, explains the rapid increase in the excretion of uric acid after taking thymus.

J. Weiss² reports further investigations concerning the production of uric acid. He gave eroton oil with the idea that, since eroton oil causes irritation of the intestinal mucous membrane and increases the number of leucocytes, it is possible that it might increase the uric acid in this way. The effect upon the uric acid excretion was entirely negative.

¹ *Journal of Physiology*, 1899, xxv., p. 98.

² *Zeitschrift für phys. Chem.*, Band xxvii., S. 216.

The ingestion of uric acid also failed to cause an increase of the uric acid excretion, but large increase was seen after taking thymus and pancreas. There was no increase after taking thymus when at the same time large doses of quinic acid were taken.

It is evident that the ultimate cause of gout is still in doubt. The older theories, and notably the theory of Garrod which persists to the present day, cannot be entertained in view of the experimental evidence accumulated in recent years. There may be some relationship between the amounts of uric acid and the occurrence of attacks, but it is seen that the fluctuation in the amounts of uric acid is not the cause of the paroxysm, and at most serves only as an index of accompanying and as yet unknown conditions. The attempt to make the xanthin bases responsible for the attacks has not been satisfactory. The methods upon which this theory was founded have been proved to be unreliable.

UNUSUAL CLINICAL FEATURES OF GOUT. Various forms of nervous symptoms are met with in cases of gouty diathesis, as, for example, migraine, neuralgias, ocular disturbances, and even neuritis. The nature of these attacks is sometimes difficult to determine. It is not improbable that some of them are due to the direct action of the gouty poison, while others may be indirect results of altered pressure of blood or arterial tension. The latter explanation is given by F. P. Atkinson,¹ in a case of gout in which there were repeated attacks of Cheyne-Stokes respiration. These attacks seemed to vary with the amount of deposit in the urine. When the gouty condition disappeared the respirations returned to the normal condition. It is difficult to draw positive conclusions from cases of this sort, and the explanation given is not altogether satisfactory.

Moscato² reports a case in which there was marked swelling of the spleen, the appearance of lymphadenomata in the peritoneal cavity, and a temporary pseudophlegmon. He bases his diagnosis of gout upon the fact that there was an hereditary gouty tendency, and the tumors appeared suddenly after dyspeptic attacks accompanied with marked deposits of uric acid. In the urine also the disease had a markedly cyclic character, and improvement of the general condition caused the tumors to vanish. He also reports a case of swelling of the left side of the thyroid gland in gout, and discusses the reports of other authors concerning pseudophlegmon, oedema, swelling of the tonsils and of the lymphatic apparatus in gout.

TREATMENT. J. F. Goodhart³ discusses under the term acidity the uric acid theory of the production of disease in its relation to the treat-

¹ British Medical Journal, May 1, 1899.

² II Morgagni, 1899.

³ Lancet, January 6, 1900.

ment of gout. He thinks that the wide-spread contention that uric acid is active in the production of disease in various forms is merely the result of the uncontrolled eagerness of the profession to get hold of something tangible. He thinks that uric acid is merely the evidence of abnormalities in metabolism, and is not itself the producer of disease, thus expressing the opinion voiced by practically all recent workers. Those who excrete an excess of uric acid, he states, will continue to excrete this excess, even if the diet is confined to foods that are entirely free of elements which form uric acid. To a patient of this class, therefore, he would give a liberal diet, limiting the character of the food only by special details which may be allowed to fit the particular case. The patients should not be limited to monotonous diet. They should also be given large quantities of water to drink, for the purpose of flushing out the urinary tract, and, if possible, for the disintegration and solution of the calculi, and the general flushing of the tissues.

Bain¹ thinks that foods rich in nucleins and nucleoproteids should not be given to subjects of gout unless further investigation shows more clearly than has yet been demonstrated that these are harmless to them. He advises a regulation of the diet, according to the condition of the gastro-intestinal tract, and orders exercise according as the patient is able to take it without fatigue. He does not think it necessary to abstain from meat, and has observed that vegetarians sometimes have gout. He considers that exercise is the most important element in the treatment. He does not think that sodium salicylate is a valuable drug, since it apparently increases the excretion of uric acid at the expense of the leucocytes.

The Use of Potassium and Sodium Salts in Gout. It has sometimes been asserted that waters which contain small proportions of sodium salts are more useful than others in the management of gout. W. Bain² has recently made a study of this subject, and has found that there was little difference in the solvent power for sodium biurate of waters differing in the amount of sodium salts contained. He very properly decides that practical experience is more valuable than such laboratory investigations of the solvent action of the water. Moreover, it is necessary to remember that the changes which the waters themselves undergo in passing through the system are probably so profound that no proper comparison may be instituted between the effects of water in test-tubes and in the living tissues.

A. P. Luff³ discusses the various forms of sodium biurate and the relation which these different forms bear to the production of gout and

¹ British Medical Journal, October 28, 1899.

² Ibid., June 10, 1899.

³ Ibid., October 28, 1899.

its treatment. He states that increase in the alkalinity of the blood from the use of sodium bicarbonate causes a correspondingly rapid transformation of the soluble gelatinous form of the biurate into the insoluble crystalline form. This is of importance in connection with the fact that mineral waters which contain large quantities of sodium bicarbonate are likely to bring on acute attacks in those who are the subjects of gout. Luff also states that in some investigations which he has made concerning the alkalinity of the blood in gouty persons he has found that the alkalinity is always higher than the average found in healthy persons, the alkalinity being due chiefly to the carbonate or bicarbonate of sodium. The reason that persons with such blood are likely to have gouty attacks seems evident. The increase of the alkalinity of the blood by the use of potassium bicarbonate lessened the rapidity of the conversion of gelatinous sodium biurate into the crystalline form and also decreased the amount of biurate formed. This seemed to explain the good effects of alkaline potassium salts in the treatment of gout.

Luff¹ gives another discussion of the causation and treatment of gout. He thinks that an attack is brought on by the inability of the kidneys properly to excrete the uric acid, so that the retention of the portion which is not excreted takes place and gouty deposits are formed. The uric acid does not cause symptoms while in solution, but, in Luff's belief, causes the paroxysms by precipitation in the crystalline form, and thus the production of inflammation in the tissues where it is deposited. In the treatment of gout he considers that it is important to use calcium, potassium citrate, and purgation with blue pills, and potassium salt in the acute attack. Elimination of the uric acid is to be encouraged by administering large quantities of water and by using potassium salts, preferably the citrate or bicarbonate, and the excessive formation of uric acid should be controlled by proper diet, the matter of chief importance being the avoidance of a large admixture of proteids and carbohydrates at any one meal. There should be careful attention to the general hygiene.

The question of *diet* has been considered by A. Haig² in discussing the treatment of headache. He attributes numerous headaches to uric acid, and treats the condition by having the patient avoid animal foods, with the exception of milk and cheese, and by forbidding tea, coffee, and vegetables which are rich in nucleins. He allows only enough albumin to produce from 3 to 3.5 grains of urea for each pound of body-weight, and uses the salicylates to clear out the uric acid already present in excess in the body. By this means he has been able to cause a pronounced

¹ Lancet, November 18, 1899.

² British Medical Journal, November 4, 1899.

reduction in the number and severity of headaches. The avoidance of meats is based upon this author's previous work, and his views have been repeatedly expounded. It is only fair to state that among investigators of this subject he stands almost alone.

Other Drugs in Gout. Various drugs are being constantly recommended and good effects seem often to have been observed. There has never been satisfactory proof that any drug but *colchicum* has a decidedly favorable effect upon the disease, and this is effective chiefly in the acute attack.

Witthauer¹ reports his result from the use of *aspirin*, which is a combination of acetic and salicylic acids. It is particularly useful in the classes of cases which are commonly treated with sodium salicylate. He found it to be a decided improvement upon sodium salicylate in gout, and useful in rheumatism, pleurisy, etc. The special advantage was that besides producing the desired effect it did not cause disturbance of the heart or stomach.

J. Wiss² advises the use of *chinic acid* in the form of a salt in cases of uric acid diathesis. It is best administered as a lithium salt, so as to get the diuretic effects of the lithium, and the dose advised is 0.5 grammes of the acid five to ten times a day dissolved in water.

W. Fearnley³ has found the use of *piperazin* of value in the treatment of gout. Together with the use of this drug he advises treatment at the sulphur baths of Harrogate and the unloading of the bowels by the use of Harrogate water. *Piperazin* has been freely used by many, and good results have often been reported, but there is still a question whether they were due to the drug or to other measures.

Giofredi⁴ reports the successful treatment of a gouty tophus within the tendon sheath of the peroneus longus by injections of *piperazin*. This drug had been used internally with improvement in the general condition, but no change occurred in the gouty deposit. Ten injections of five-sixths of a grain of *piperazin* were made, and the tophus was completely absorbed. The first injections were painful, but afterward the parts were sprayed with ether before the injections, and no pain occurred.

D. Graham⁵ records rapid improvement, in a case of gout, from massage, general and local, with applications of the negative pole of a *galvanic current* to the diseased joints, while H. L. Jones⁶ advocates *electric-light baths* in the treatment of gout. These baths are supposed

¹ Therapist, August 15, 1899.

² Berliner klinische Wochenschrift, April 3, 1899.

³ British Medical Journal, December 30, 1899.

⁴ Gaz. degli Ospedali, August 20, 1899.

⁵ Boston Medical and Surgical Journal, June 1, 1899.

⁶ British Medical Journal, March 18, 1899.

to be highly efficient in inducing sweating, acting more quickly than hot-air baths. The author believes that heat penetrates more deeply, and seems inclined to the view that other obscure effects are produced.

M. A. Cleaves¹ also advocates the electric-light baths, though she did not employ them in cases of gout.

ADDISON'S DISEASE.

Writings of the past year have developed little that is new concerning Addison's disease or its etiology, and the more important communications are devoted to diseases resembling this affection in their apparent origin in disease of the suprarenal glands.

Zaudy² records the post-mortem examination of the body of a man, aged forty-six years, which showed no lesions of any consequence excepting marked caseation of both suprarenal glands and swelling of the lymph-glands. There was no tuberculosis elsewhere in the body. The man's complaints during life had been chiefly of pain in the chest, back, and left arm and leg, followed by marked emaciation. There had in the latter part of life been some enlargement of the liver, tenderness in the abdomen, and severe vomiting, with dysphagia. The oesophagus was not constricted, however, as the sound could be passed readily. Because of the severe disturbance of the stomach and the marked emaciation it had been decided that the man probably had cancerous obstruction of the pylorus, but there was some thought of peritonitis of obscure origin. When, however, the post-mortem disclosed caseation of the suprarenals, and more careful examination showed pigmented spots on the temples and lips, Zaudy decided that it was a case of Addison's disease, and he insists that with a similar symptom-complex resembling peritonitis with severe emaciation, one is justified, if no other cause can be found, in deciding upon the existence of Addison's disease, even though other signs of the disease are entirely absent. This statement is based upon this case and a similar one previously reported by Ebstein, in which suprarenal disease was discovered.

The classification of such cases as Addison's disease seems a little strained, however, since suprarenal tuberculosis may, as is well known, exist without producing this disease, and the symptoms in Zaudy's and Ebstein's cases were not of the classical kind generally seen with Addison's disease. The relationship of the symptoms to the disease of the suprarenals cannot be considered to be so well established as to permit of a clinical diagnosis of Addison's disease in similar cases, and

¹ New York Medical Journal, January 28 and February 4, 1899.

² Zeitschrift für klinische Medicin, Band xxxviii., Heft 4, 5 and 6.

it is possible that different varieties of chronic disease that cannot well be classified under one name may be due to alterations in the suprarenal glands. It is at least worth while to consider such a possibility rather than to call all obscure affections associated with suprarenal alterations Addison's disease, and that this may be true is suggested by cases of very acute disease in which suprarenal changes are found and in which the symptoms bear no definite resemblance to Addison's disease. An example of the latter class of cases was reviewed last year, and E. Sergeant and L. Bernard,¹ who recorded that case, have made a more elaborate study of such conditions, and describe a clinical syndrome with an acute course, due to insufficiency of the suprarenal capsules, but not corresponding to Addison's disease. They find numerous cases reported in which the clinical appearance of Addison's disease was seen without characteristic changes in the suprarenal glands. The contrary is also well known, and these authors consider that the reason is that when the suprarenal glands are destroyed alone, and the nerves are unaffected, a disease is produced which differs from Addison's disease and resembles the condition seen after extirpation of the suprarenal glands. This may have a course of variable length, some cases being of the utmost rapidity. Such very rapid cases are particularly interesting from a legal stand-point, and the possibility of such an affection should be especially considered in instances of sudden death in collapse or coma, or in connection with epileptiform convulsions after severe injury or operation. The suprarenal capsules should be carefully investigated under such circumstances.

The authors conclude that there is a clinical syndrome due to destruction of the suprarenal glands which resembles the conditions produced by the experimental removal of those glands, which may run a foudroyant, an acute, or a subacute course. This symptom-complex should not be confounded with Addison's disease, though it may complicate it. The chief distinction they make is that Addison's disease is always accompanied by pigmentation of the skin, while the other is not. Addison's disease and this acute insufficiency of the suprarenal glands may be considered analogous to chronic hepatitis and icterus gravis; they are related to each other only in the fact that the suprarenal glands are involved in both. Sergeant and Bernard do not consider disturbance of the suprarenal glands essential to the production of Addison's disease, but as usually associated with it.

Their theory concerning the influence of involvement of the glands alone, or of the glands with the nerves, upon the character of the disease produced, is not one that is proved by investigation, but instances of rapid death in which hemorrhages into the suprarenal glands or other

¹ Archiv générale de Médecine, July, 1899.

changes in them were found have fallen under my notice, and such cases, taken in conjunction with the effect of experimental removal of the adrenals, indicate that disease of these bodies may have other effects than the production of Addison's disease, and perhaps in chronic cases as well as in acute. The previous study of the adrenals in chronic disease has been too exclusively directed toward showing a relation with Addison's disease, as this affection is commonly known, and investigations in other relations may develop new ideas.

Acute Addison's Disease. The rapidity of the course of Addison's disease in some cases is well exemplified by a report by Esser,¹ who describes a typical case which ran an extremely rapid course. The patient was a man, aged thirty-three years, who began to grow weak five weeks before he was seen, and became unable to work. The disease had begun six weeks before with pain and fulness in the region of the stomach, followed by increasing loss of strength. There were also diarrhoea, vomiting, and cramp-like pains in the abdomen. He died eighteen hours after admission to the hospital. The characteristic changes were found in the suprarenal glands and in the skin. Esser refers to Crusin,² who reported eleven cases of Addison's disease with an extremely rapid course.

Addison's Disease with Purpura. Vollbrach³ reports the case of a girl, aged fifteen years, who had severe purpura, and eleven months afterward was admitted into the hospital with the typical symptoms of Addison's disease. She was treated for thirty-two days with extract of suprarenal gland, and was then discharged improved. A month and a half afterward she was again admitted with signs of meningitis, and died a short time afterward. The autopsy showed that there was no meningitis, the symptoms having probably been agonal signs of irritation of the brain caused by cerebral hyperaemia, with consecutive oedema of the brain. The suprarenal glands were extensively involved by tuberculous disease, and the author decides that the destructive process was going on in the kidneys a long time before the clinical signs indicated Addison's disease. He, therefore, concludes that the purpura was not a mere accidental occurrence, but that it was perhaps evidence of a hemorrhagic diathesis, and at any rate the sign of an already existing damage to the organism through the tubercular disease of the suprarenals.

Pigmentation Resembling Addison's Disease. The difficulty that is experienced at times in deciding whether pigmentation of the skin with general adynamia is due to Addison's disease is shown by the fol-

¹ Zeitschrift für Præt. Aerzte, 1899, No. 4.

² Thèse de Paris, 1898-1899.

³ Wiener klinische Wochenschrift, 1899, No. 28.

lowing report. E. Enriquez and P. Lereboullet¹ describe a case of general arsenical pigmentation of the skin which resembled Addison's disease. It occurred in a man, aged forty-seven years, who had taken arsenic for eczema. After taking fifteen drops of Fowler's solution daily for about three months he had attacks of fainting, and some months later the skin showed pigmentation which gradually spread over the body. He had excessive secretion of tears and severe conjunctivitis, together with some adynamia. The arsenic was continued for a time, as a diagnosis of Addison's disease was made. The pigmentation and emaciation grew worse, but the general symptoms improved, and a year afterward there was nothing notable except wide-spread pigmentation, which consisted of light and dark spots, more marked in certain areas and most notable about the buttocks; there was slight pigmentation of the mucous membrane of the mouth. There was also arsenical keratosis of the palms and hands, but no evidence of arsenical neuritis. In the previously reported cases of pigmentation of the skin following the use of arsenic the pigment was always seen in both darker and lighter spots. It usually appears two or three months after beginning the use of the drug. This patient took about 4 grammes altogether, the pigmentation beginning after taking about a gramme and a half, but much smaller amounts have sometimes caused decided pigmentation. In some cases the pigmentation vanishes soon after stopping the use of the arsenic. The pathology is not clear.

TREATMENT. Burghart² discusses the results obtained from the use of a number of organic extracts in various diseases, and records two cases of Addison's disease treated by suprarenal tablets. Both died without improvement, and one seemed to be made decidedly worse, fever, loss of appetite, and prostration resulting from the treatment. The earlier hopes of constant good results from the use of suprarenal gland have not been realized, but bad effects are certainly unusual if the dosage is properly regulated, and it must always be proved that the preparation used was a good one and well preserved before it can be considered as established that the glandular extract itself produced the bad effects. The use of thyroid gland is, however, very frequently attended with serious symptoms, and it is not unlikely that as suprarenal preparations become more commonly used records of unfavorable effects will be more frequent. The reports that have already appeared indicate that it should always be given very carefully and its effects well watched.

There have been no other recent records, excepting that of Box, referred to before, of interest concerning the treatment of the disease.

¹ *Gaz. hebdomadaire de Médecine et de Chirurgie*, July, 1899, No. 54.

² *Deutsche medicinische Wochenschrift*, September 14, 1899.

OBESITY.

F. Hirschfeld¹ discusses the amount of food used by obese persons. It is common to many authors to describe the subjects of obesity under two classes—those who take too much nourishment and too little exercise, and those who have a peculiar character of constitution and who may take even far less nourishment than seems necessary, but yet who suffer from abnormal metabolism and remain excessively fat or grow fatter. Hirschfeld does not believe in this second variety. He considers that if such persons exist at all they are extremely rare. This opinion is based upon the examination of forty cases whose food was investigated and whose respiratory intake and outgo were determined; in no instance did he find a reduction of the intake of oxygen; the amount of food taken and the metabolism of the obese in quiet life and with slight muscular activity seemed quite as great as in leaner persons who were living the same sort of life. He chose for comparison lean persons who were about the same size and muscular constitution and merely showed a difference in the amount of fat. Merely because there is a lack of experimental evidence that imperfect fat reduction occurs we are certainly not justified in saying that this cannot occur. There is certainly proof that excessive destruction of fat may be seen, and to deny the contrary because of lack of proof is unreasonable and premature.

G. Rosenfeld² discusses the principles of the treatment of adiposity. He considers it extremely improbable that fat is formed from proteids, and fatty degeneration, he believes, consists in the reduction of the amount of proteid or glycogen in the cells and the replacement of this by the entrance of preformed fat particles. Fats may be formed in the body from both carbohydrates and fats, but almost all come from fats. It is characteristic of fat that it may be readily transported from one part of the body to another. It is oxidized with the greatest difficulty of any of the three chief varieties of food, and is usually deposited in the tissues without any marked change in its character. Albumin is destroyed and excreted without being changed into fat. Carbohydrates are not deposited in the body unless they are changed into fats. They are particularly suited to rapid oxidation, hence he considers that for men, as well as animals, in order to reduce fat it is important to reduce the amount of fat taken in the food. The next matter of importance is to reduce the carbohydrates. Rosenfeld's work is certainly the most authoritative yet done on the question of the production of fat, and is sufficient to justify him in his statements, radical as they are.

¹ Sammlung klin. Vorträge, April, 1899.

² Berliner klinische Wochenschrift, 1899, No. 30.

H. Kisch¹ discusses his results from the use of thyroid gland in obesity. In the plethoric form the use of the gland for two or three weeks had little influence unless the diet was carefully regulated. There was some evidence of rapid loss of flesh when the Marien Springs cure was instituted at the same time. But the use of the thyroid was accompanied by unpleasant symptoms. Anaemic patients who were excessively fat showed rapid loss of fat under the use of thyroid gland, but the accompanying unpleasant symptoms caused Kisch to desist from its use. This has been the general experience with the use of thyroid in obesity unless the greatest care was exercised, and it is certainly necessary to be very watchful if it is used, lest seriously unfavorable effects ensue.

Burghart² describes an interesting result obtained from the use of ovarian tablets in a girl, aged twenty years, who was excessively fat, imbecile, and unable to earn her living. She had never menstruated, and examination showed infantile internal genital organs, hence the use of the ovarian tablets. The result was very marked increase in the muscular power and improvement in intelligence, with cure of the constipation and a very decided decrease in body-weight. The girl became entirely capable of making her own livelihood, but the condition of the genital functions was unaltered.

RHEUMATOID ARTHRITIS.

There have been many attempts to prove that rheumatoid arthritis is an infection. Undoubtedly many cases are precipitated or intensified by the effects of some infections upon the joints finally affected by the rheumatoid arthritis. In many cases, however, any infection present in the case may be only an association, and there is as yet no proof that the disease results from the action of micro-organisms.

G. A. Bannatyne³ describes a case of rheumatoid arthritis in a woman, aged fifty-seven years, which had lasted for twelve years. The woman developed acute colitis and became much prostrated. As the attack was passing off pericarditis developed, and three weeks later pleurisy, first on the right and afterward on the left side, and she finally died of bronchopneumonia. One knee-joint was examined after death, and showed acute destructive disease, without any bony or cartilaginous outgrowth or thickening. The cause of the disease of the serous membranes and the ultimate pneumonia was believed to have been distinct from the joint condition, and was probably an infection.

¹ Wiener Medicale Presse, 1899, No. 6.

² Deutsche medicinische Wochenschrift, September 11, 1899.

³ British Medical Journal, October 14, 1899.

The ultimate effect of infectious joint diseases is often that which is mentioned by R. Pelisse¹ in discussing the recurrences of blennorrhagie rheumatism. This is a common observation, and the occurrence of one attack of gonorrhœa does not prevent a person from subsequent development of gonorrhœal rheumatism. It is likely to appear within a few days after the acute stage of gonorrhœa has passed, and in severe forms there may be a recurrence of the joint symptoms after each new infection. In most instances after many recurrences the arthritis, which at first is likely to have assumed a pseudophlegmonous form, takes the appearance of progressive deforming arthritis pseudonodosa.

A striking degree of anaemia with rheumatoid arthritis was seen by J. S. Billings, Jr.,² who records the case of a woman, aged forty-seven years, who presented the usual appearance and history of arthritis deformans, and in whose history there was noted an interesting family tendency to the disease, her mother and maternal grandmother both having shown marked cases of the affection after middle life. This woman had been losing strength for about a year, and had grown extremely pallid, her color having become lemon-yellow. The red corpuscles were reduced to 1,344,000, the leucocytes to 9200. The leucocytes were chiefly lymphocytes (84.3 per cent.). Nucleated red cells were absent, but it was believed that the case was one of pernicious anaemia.

Treatment. R. A. Bayliss³ discusses acute rheumatoid arthritis, giving a description of the symptoms and of the changes produced in the tissues. He considers it important to wear woollen garments constantly and to reside in a dry climate. The digestive organs, particularly, should be kept in good order or disturbances corrected, and hot baths with hot and cold douches are of value, as are massage and hot air in the treatment of the ankylosis. Locally, he has found guaiacol and salicylate of methyl, diluted with olive oil, very useful, and for internal use he has found guaiacol carbonate valuable. The local use of guaiacol produced the best results, but pain was much relieved by the methyl salicylate. For acute inflammation he found the use of hot boric acid dressings very satisfactory, and for distention of joints with fluid he has several times found aspiration useful.

There have been a number of satisfactory results from surgical procedures reported in recent years. F. W. Collinson⁴ describes a case of what appeared to be rheumatoid arthritis. It occurred in a woman, aged twenty-two years. The difficulty had been present for eleven years, and had begun in what was thought to be a sprain of the ankle. The joint gradually enlarged, and at the time of admission most of the joints were affected, with the exception of the small joints of the fingers.

¹ Thèse de Paris, 1899.

³ Edinburgh Medical Journal, August, 1899.

² Medical Record, September 30, 1899.

⁴ Lancet, November 1, 1899.

There was complete ankylosis of the left ankle and right elbow and almost complete ankylosis of the left elbow. The symptoms of rheumatoid arthritis were not distinctive, however. Collinson first performed excision of the right elbow, and afterward excision of the left elbow. The patient recovered well from the operations, and while hitherto she had been unable to feed herself, six months afterward she was earning her own living and using her arms with comparative ease and comfort.

Taylor,¹ in discussing the medical uses of electricity, states that used as an electric bath he has found this agent of value in relieving the distress in rheumatoid arthritis.

W. Ewart² recommends rubbing of the affected joints with small blocks of ice in rheumatoid arthritis, acute rheumatism, and some other painful diseases in which he has employed the method. The massage is continued for some minutes at a time, and in the cases in which he has tried it there has been great relief.

Rhizomelic Spondylosis. There is considerable probability that the condition which Marie called rhizomelic spondylosis, and which he considers a distinct disease, is rheumatoid arthritis of unusual location. A. Leri³ records the changes found in the spinal column in a case of this kind previously reported by Marie. The most notable alteration seen was the remarkable curvature in the cervical and dorsal regions, the spinal column forming a complete quadrant of a circle, so that the upper cervical vertebrae ran in a course at a right angle to the course of the lumbar vertebrae. In the lower lumbar region there was some lordosis, the vertebrae were absolutely fixed, and motion was impossible. The chief alterations to account for the latter were, first and most prominently, general ossification of the ligaments, which was limited almost entirely to the ligaments on the convex surface of the curvatures, and, secondly, a marked hypertrophy and ankylosis of the articular extremities. The changes in the articulation seemed to be due to the primary softening and secondary ankylosis, so that the ankylosis appeared to be a conservative process.

SCLERODERMA.

The obscurity of the origin of this uncommon disease is well known. Some additional evidence that it may be due to nervous changes is offered by L. Brunsch,⁴ who describes a case of diffuse scleroderma of the legs showing a peculiar sharp boundary corresponding to a spinal segment.

¹ Clinical Journal, October 11, 1899.

² Lancet, April 8, 1899.

³ Revue de Médecin, September, 10, 1899.

⁴ Deutsche medizinische Wochenschrift, July 27, 1899.

The disease had appeared in the right foot as a bright red swelling which had involved the right leg and then the left, advancing up as far as the lower part of the buttocks, the limitation being behind at the end of the second spinal vertebrae, running forward for about 12 cm. and then somewhat upward and finally falling down along the course of Poupart's ligament. The genitalia were unaffected. The skin showed much thickening and was parchment-like and changed in color. Bruns thinks that the peculiar distribution in this case and the evidences of trophic changes that are often seen are strong testimony that the disease arises in changes in the spinal cord.

MYOSITIS OSSIFICANS.

R. Crawford and H. Lockwood¹ describe a case of progressive myositis ossificans in a lad, aged six and a half years, whose personal and family history were without any definite bearing on his case. The right pectoralis major was found affected, and subsequently masses developed in the back, in one of the elbows, and in the shoulders. These joints became quite fixed and the masses in the back became quite large. Another case is described by Nicolaysen,² which occurred in a girl, aged four and a half years, and began at the age of two years, in the right shoulder. This joint became stiff, and finally there was almost immobility; later there was nearly complete ossification of the muscles of the back, neck, and shoulders, and the shoulders were firmly fixed to the thoracic walls. In addition there were masses in the arm and forearm. The rarity of this disease is shown by the fact that the author was able to collect only forty-two cases.

MYXŒDEMA.

Etiology. The study of the function of the thyroid gland, even when not undertaken in direct relation to myxoedema, is of importance in attempting to explain this disease. I. Lévin³ has directed attention to the fact that some authors have contended that mucinæmia is the cause of the symptoms in persons suffering from the loss of the function of the thyroid gland. In order to determine the correctness of this view he removed the thyroid gland from rabbits, and then made a subcutaneous injection of a 1 per cent. solution of sodium bicarbonate containing mucin, injecting the same substance into other rabbits that had not been operated upon. The injection of mucin was entirely without effect in the normal animals, but of the nine from which the thyroid

¹ Lancet, April 15, 1899.

² Norsk. Mag. Laegevid., April, 1899.

³ Medical Record, February 3, 1900.

had been removed only one recovered. The effect of the mucin was believed to be due to depression of the vasomotor centre in the medulla and the consequent marked fall in the blood-pressure, since Levin found that the injection of mucin caused a decided fall in blood-pressure; this continued after the vagi and splanchnics were cut, but the pressure rose again after stimulating the splanchnic. From this work Levin concludes that the cause of the symptoms in those persons who have lost their thyroid function is mucinaemia. This certainly does not constitute proof of this. It merely indicates that resection of the thyroid renders an animal unable to withstand the injection of mucin, but does not show that mucinaemia occurs after loss of the gland's function.

A more probable explanation of the symptoms resulting from loss of thyroid function, and one which has been considered by a number of writers in recent years, is that discussed by D. Baldi,¹ who has undertaken investigations to determine whether the thyroid destroys a poison which is normally found in the organism. Did such action take place it would be expected that the blood would contain considerable quantities of such poison after the thyroid was extirpated. The blood-serum of animals that had been deprived of their thyroids was injected into young dogs. No symptoms of poisoning followed, but it seemed rather to improve the symptoms which had resulted if thyroideectomy had been previously performed. It is possible, however, that the toxin had caused the production of an antitoxin, and that the serum immunized the animals into which it was injected. This seemed negatived, however, by the fact that the injection of normal serum caused the same results as did the serum from the animals that had lost their thyroids. Hence it seemed probable that the thyroid does not destroy any toxin which is produced in the body, or at any rate that this toxin does not gain entrance into the circulation.

J. Katzenstein² has made some experimental studies concerning the importance of the thyroid gland. These were carried out on dogs, and consisted in removing the gland on one side and dividing the connections of the gland on the other side with the connective tissues and bloodvessels, and then enveloping this gland in various substances in order to prevent it from becoming adherent to the tissues again. His chief conclusions are drawn from the results of ten operations in which the gland was enveloped in a fish bladder. Three of these animals died at once, and were therefore excluded from consideration. Of the remaining seven, four, or 57.3 per cent., remained entirely well. He therefore decides that while this small number is not sufficient to justify any other conclusions, it does show that the thyroid gland is not a structure

¹ Arch. Ital. de Biol., 1899, xxxi., p. 281.

² Deutsche medicinische Wochenschrift, November 30, 1899.

which is necessary for life. He also found that by cutting the nerves leading to the thyroid gland he could cause complete degeneration of the gland. This showed two stages. In the first there was gradual degeneration of the epithelial cells, loss of distinction between the principal cells and the colloid cells, and the whole mass seemed to have the appearance of homogeneous colloid. In the second stage, owing to the degeneration of the gland, there was loss of large amounts of epithelial tissue, so that the gland had the appearance of cavities with projecting masses, and the whole took on much the appearance of the folds of the intestine. The animals in spite of this advanced degeneration seemed to be in entirely good health. Katzenstein does not believe that there is evidence that any other organ may vicariously carry out the function of the thyroid, and, because the greater part or nearly all of the gland may be lost without impairment of health, he thinks that the thyroid is not essential to the life of the animal.

The conclusion that the gland is not necessary to life and health is unjustified. There are numbers of experiments and post-mortem and clinical observations which go to show conclusively that a small remnant of the gland suffices to prevent severe disturbance of health when the greater part of the gland has been removed or has degenerated. But many other observations are on record which must convince one that entire loss of the gland will certainly result in death or grave impairment of health.

E. Roos¹ has carried on an investigation to determine in how far the amount of iodine contained in the thyroid gland influences the effect of the gland. He gave to dogs the thyroid glands of children which contained a known amount of iodine and thyroid glands of dogs which had been given potassium iodide during life in order to increase the amount of iodine in the gland. He investigated the metabolism under these circumstances, and found that the action was greater in accordance with the amount of iodine contained in the gland, and almost disappeared when iodine was nearly absent from the gland. This is contrary to Blum's theory that the gland contains toxic albuminous substances which combine with the iodine and thus lose their poisonous properties. Roos also investigated the amount of iodine in the thyroid glands of various animals, and found that those of the carnivorous animals contained much less iodine than did the glands of animals that lived upon vegetables and plants.

Oswald² has attempted to obtain the iodine-containing substance of the thyroid gland in its original form. This he considers accomplished by extracting with ammonium sulphate, by which means he obtained

¹ Zeitschrift für Physiologie Chem., 1899, xxviii., p. 40.

² Münchener medicinische Wochensehrift, August 15, 1899.

two proteid bodies with very different action. One contained iodine, and resembled the globulins, and Oswald called this thyreoglobulin; the other was a nucleoproteid, and contained phosphorus, but no iodine. About 10 per cent. of thyreoglobulin was obtained from the moist thyroid. This substance caused marked increase of nitrogen excretion, while the nucleoproteid left the nitrogen metabolism uninfluenced. Hence the thyreoglobulin seemed to be the specific substance of the thyroid gland, so far as its action upon metabolism is concerned. The thyroid substance of the gland contained both thyreoglobulin and the nucleoproteid. Since the colloid material may be found in the lymphatics leading from the thyroid, Oswald believes that the gland furnishes a secretion which enters the blood, and that the organ does not act solely by processes which take place within it. The secretion, he believes, regulates metabolism, and the symptoms seen in cases showing lack of thyroid action are, in his opinion, probably due to the effects of products of intermediate katabolism. He thinks that during the action of the thyroid secretion the thyreoglobulin is decomposed and iodine is separated. Normally, this is carried back to the thyroid gland and stored there. He has found that the thyreoglobulin caused improvement in two cases of myxœdema.

H. Roger and M. Garnier¹ discuss the pathological anatomy of the thyroid gland in thirty-six cases of infectious diseases which they examined. These included typhoid fever, measles, scarlet fever, and other diseases, and they also studied the changes produced by injection of toxins. At first the thyroid gland shows excess of secretion; subsequently the secretion appears cloudy and granular, and finally the cells appear to lose their function, become clear, and produce no more secretion. It does not seem possible to recognize these changes clinically during the course of the infection, but they consider it important to recognize their existence, since they may readily lead to later changes. Thus it is possible that alterations due to infections may sometimes ultimately produce myxœdema.

Clinical Features of Myxœdema and Similar Conditions. A number of cases have been recently reported in which there have been some suggestions of myxœdema, though the symptoms have not been at all complete or positive. In one group of cases there have been quite marked symptoms indicating myxœdema, but also signs of some other affection, as acromegaly, exophthalmic goitre, etc. These ill-developed, uncertain cases require much more careful attention, and will no doubt throw a good deal of light upon the essential pathogenesis of myxœdema. A number of the systematic authors have called atten-

¹ *La Presse Médicale*, April 19, 1899.

tion to these irregular forms of disease. Buschau says "that the diagnosis is extremely difficult when the disease is imperfectly developed or when it presents itself as a form verging toward obesity." He suggests that the diagnosis may be made by the treatment. Thibierge,¹ in his monograph on myxoedema, classifies the cases of imperfectly developed myxoedema. In adults the symptoms observed in such instances are a habitual apathy, the development of a slight fatness or increase in the size without exactly an infiltration of the skin, and in more marked cases a red spot of congestion on the cheek, a constant complaint of coldness, and a decreased size of the thyroid gland. These symptoms would undoubtedly suffice to suggest an impairment of function of the thyroid and the existence of myxoedema. They would not, as Hertoghe² contends, indicate the existence of frank myxoedema. There are somewhat more distinct symptoms that are often seen before the disease still remains in an abortive form. In children, Thibierge also recognizes ill-developed cases, and states that when the patient remains infantile in his general proportions and ill-developed, the condition is probably one of myxoedema if the influences of hereditary syphilis be excluded. Hertoghe, in alluding to the same subject, would not exclude the cases of hereditary syphilis, as he believes that this may be a condition that determines the thyroid inactivity, and that the symptoms, whether they occur in children who have hereditary syphilis or in other children, are still the symptoms of ill-developed myxoedema. He believes that all forms of infantilism, whether the height be greater or less than normal, are instances of improper action of the thyroid gland. Whether the arrest of development affects the height or not, and whether it is due to hereditary syphilis, to alcoholism, to malaria, or to tuberculosis in the parents, there is always in such cases of infantilism affection of the vitality of the thyroid gland. The cases may differ very widely in the same family, as he has seen two cases of frank myxoedema with idioey; two cases of marked condrodystryphosis and rachitic dwarf, and a case of infantile obesity in one family. He has treated two first cousins, of whom one represented the infantile type described by Lorain, and the other was a case of frank myxoedema. A lady affected with exophthalmic goitre had a child with infantilism of the type of Lorain, larger in stature than normal, and quite intelligent, but unquestionably infantile from his lack of other development. Hertoghe then proceeds to show that the condition of ossification in the bones is similar in infantiles to that observed in myxoedema, and the treatment of ill-developed cases with thyroid gland has given unequivocal results. In attempting

¹ *Monographies Cliniques sur les Questions Nouvelles sur Médecine, Chirurgie et Biologie*, 1896.

² *L'Hypothyroïdie Benigne Chronique ou Myxoedème Fruste*, Paris, 1899.

to classify the different forms of infantilism the author practically refers to every organ, part, or function of the body, showing that any of these may be deficient as a result of such hereditary thyroid inactivity, and he asserts that a careful investigation of the history of the parents not only at the time, but from their whole development from childhood, will reveal some indications of frank or ill-developed myxedema in almost every instance in which there is infantilism in the child. While few authors will care to go as far as Hertoghe, there is no doubt that many partially developed cases of myxedema exist, and that these are frequently overlooked or considered as instances of some other disease.

It has been noted that syphilis may lead to confusion, and this may occur with other affections less frequently, as shown by the following case. J. de Barry¹ reports the case of a girl, aged twelve years, who had disease of the heart, with subsequent changes in the kidneys. She had previously had rachitis, and the remnants of this disease, together with marked oedema, gave an appearance which was almost exactly like the appearance of infantile myxædema. The thyroid gland was normal.

The difficulty in diagnosis is often quite as great in cases that are really myxædema, the early symptoms being often extremely inconclusive.

C. W. Chapman² describes three cases of myxedema which were seen in the early stages. None of them presented at first sufficiently distinct symptoms to lead to a diagnosis. In the first there was practically nothing in the early stages but pronounced and obstinate anaemia, the myxedema being first made apparent by the appearance of mental dulness. The second case was also at first merely severely anaemic, while in the third there was pain in the pericardium and dyspnea. Chapman calls attention to the difficulty in early diagnosis of this affection, and as a frequent sign mentions a solid appearance of the conjunctiva.

Combined Symptoms of Myxædema and Other Affections. An interesting case of an acute myxædematous condition with glycosuria, tachycardia, and other marked nervous symptoms was recorded last year by Osler and was referred to in *PROGRESSIVE MEDICINE*. Another instance of association is published by Jolly,³ in which myxedema and exophthalmic goitre were found in the same case. The thyroid gland was atrophied; the pulse was very rapid; there was marked exophthalmos, with a tendency to sweating. It is sometimes rather difficult in cases of this sort to make a positive diagnosis when two diseases are supposed to coexist in which symptoms of diverse character are ordinarily met with; typical myxedema is characterized by dry skin, while moisture is found in exophthalmic goitre.

¹ *Archiv für Kinderheilkunde*, Band xxvi., No. 253.

² *Lancet*, September 30, 1899.

³ *Journal of the American Medical Association*, April 15, 1899.

There is more certainty in the diagnosis of a combination of the two diseases in the following record: M. Faure¹ describes a fatal case of exophthalmic goitre which was combined with myxœdema. The patient was a woman, aged thirty-two years, who became ill in 1886 and had grown gradually worse up to 1894, when the thyroid had decreased in size and the symptoms had grown less. In 1896 she had swelling of the face, was sleepy, had poor memory, tremor, exophthalmos, and a small, hard goitre. The pulse was irregular, 100 to the minute. She improved somewhat on iodothyroin, and afterward the improvement was still more marked. The pulse was reduced to 88, the goitre had almost disappeared, and there were almost no symptoms left excepting some prominence of the eyes and œdema of the legs. There then occurred attacks similar to tetany. She had diarrhoea, and died of cardiac weakness. The post-mortem examination showed hypertrophy of the heart; the thyroid gland was transformed into a firm adenoma, which weighed 100 grammes. It seemed to have caused compression of the sympathetic of the neck. The nervous system showed no changes.

In rare instances myxœdema has followed exophthalmic goitre, and in this case it is probable that this occurred. That it should occur is not surprising, when one considers the apparent close relationship of both diseases to the thyroid gland.

A. Hymanson² records a case which he believes was probably a combination of acromegaly and myxœdema. The patient was a woman, aged thirty-nine years, who had the appearance of the face, chest, and hands common in acromegaly, but there was some appearance of œdema in certain areas. The skin was soft, and radiographs showed thickening of the soft parts as well as of the bones. No improvement occurred upon the use of thyroid or pituitary extracts.

This, again, is one of those mixed cases in which a diagnosis is difficult, and it is questionable whether one has a right to call them combinations of the two diseases. That we may expect such a combination is rendered probable, however, by the observations next to be detailed. The probable relation of the hypophysis cerebri to acromegaly is well known, and this renders the report of E. Ponfick³ of much interest. He records two cases of myxœdema in which, besides marked disease of the thyroid gland, there were advanced changes in the hypophysis. The first case occurred in a man, aged forty-seven years, who died from pneumonia before the myxœdema was sufficiently advanced to have caused death, and therefore the conditions related to the myxœdema were observed earlier than is often the case. In this case the thyroid

¹ *La Presse Médicale*, September 23, 1899.

² *Medical Record*, July 1, 1899.

³ *Zeitschrift für klinische Medicin*, Band xxxviii., Heft 1, 2, and 3.

was found very much reduced in size, and the glandular tissue was to about three-fourths of its extent destroyed, and there was much increase of the interstitial tissue. The hypophysis was moon-shaped, and there was a long, narrow pedicle. The changes in the gland were analogous to those found in the thyroid; the glandular tissue had almost vanished; there was a great increase of the connective tissue, and there were small concrement-like particles in the gland—an evidence that the process was far advanced in this organ. There were similar advanced changes in the hypophysis in the second case, and the alterations in this gland were so great in the two cases that Ponfick believes that they cannot be overlooked in considering the etiology of myxœdema, though their relation is as yet uncertain, and further cases must be observed to determine whether the hypophysis is related to myxœdema. At any rate, the changes in this gland were much more advanced than those in the thyroid, and the alterations seemed to have begun here.

D. Sommerville¹ describes a case of brain tumor which resembled myxœdema. The man was fifty-six years of age. His complaints were chiefly weakness of the lower extremities, loss of memory, and headache, and he had two falls while in the street, on each occasion backward and toward the right. The headache had increased, as had the general weakness, and a tumor of the brain was thought possible, for the skin was exceedingly myxœdematous in character, the perception was slow, there was some deformity of the hands, and the pulse was slow, and, as stated, he had general pronounced weakness; also, there were no eye changes, and vomiting was absent. He was given thyroid extract, and improved very greatly within six weeks. Afterward he became decidedly worse, developed paralysis, and died soon afterward, and a large glioma was found in the right occipital lobe, while the thyroid gland was found to be normal.

Treatment. The results from the use of iodothyroin as a substitute for dried thyroid gland or thyroid extract of various sorts have not been uniformly satisfactory, though some authors have found the drug as powerful as the extracts or the dried gland.

Recently, S. Kuh² reported two cases of myxœdema, in one of which he used iodothyroin and in the other dried thyroid. The former drug caused no disagreeable results, and its effects were quite as marked as were those obtained with the dried gland.

¹ British Medical Journal, January 20, 1900.

² Philadelphia Medical Journal, April 8, 1899.

EXOPHTHALMIC GOITRE.

Etiology. The similarity between the symptoms of severe iodism and exophthalmic goitre has been noted by a number of observers. P. Jaunin¹ believes that chronic iodism produces a condition which is indistinguishable from thyroidism or exophthalmic goitre. He finds that chronic iodism appears almost exclusively in persons with goitre, and that small amounts are often sufficient to cause an outbreak of exophthalmic goitre. He finds, too, that patients with chronic iodism are not infrequently considered to be tubercular, but that their symptoms disappear after the use of the iodine and after the institution of proper rules of life. If, however, they begin to take iodine again they have a renewal of the symptoms. Among the instances which he details to illustrate his point may be mentioned the case of a girl, aged thirteen years, who had goitre, some emaciation, tremor, exophthalmos, and excessive perspiration. She had been using iodine ointment for the goitre, which had been present since her childhood. Stopping the use of the iodine caused immediate improvement, and within a few months she became entirely well. In another instance a cook, fifty-two years old, who had had for several weeks all the symptoms of Graves' disease excepting the prominence of the eyes, was found to have treated a sore with iodine salve and to have taken potassium iodide. The same symptoms had occurred before in this patient after taking iodine preparations, and similar symptoms had occurred in her mother. She improved at first after stopping the iodine, but had a sudden attack of heart-failure and died.

G. Gautier² describes cases similar to those reported by Jaunin. He states that in Genf it is found that people coming from other regions are extremely sensitive to iodine. The people are in general subjects of exophthalmic goitre, and a slight amount of iodine produces distinct symptoms of the disease. The women usually show some swelling of the thyroid gland, and this is oftentimes associated with some atrophy of the breasts. Gautier also notes that the secretion of milk is markedly decreased by iodine, and reports the case of a woman whose milk secretion had largely decreased after taking a water containing iodine. Among the people in this region it is sometimes noticed that the use of iodine for dental abnormalities causes attacks similar to exophthalmic goitre. Cases showing this effect of iodine and iodoform are reported. Gautier considers that the waters at Genf are likely to become harmful if used for more than a few weeks, and describes cases that had become

¹ *Revue Méd. de la Suisse Rom.*, 1899, vol. xix., No. 5, p. 301.

² *Ibid.*, p. 618.

gravely ill after staying at Genf. One of them became permanently melancholy and another maniacal. Gautier notes particularly that if the thyroid function is once disturbed by the use of iodine it often takes a long time to overcome this effect.

The theory that iodism is the same condition as exophthalmic goitre is closely related to the belief that has become very general that the symptoms of the latter disease are due to excessive action of the thyroid, probably associated with perverted function. The active constituents of the secretion of the gland seems to be the iodine compounds. That hyperacidity of the gland causes the disease is rendered more probable by the previous reports of a number of cases like the following: A. Boinet¹ describes a case in which symptoms of Graves' disease and psychic disturbances were produced by taking large quantities of thyroid. The patient was a man, aged twenty-nine years, who had had general dermatitis, but had otherwise been well. He was advised to take one sheep's thyroid daily. The skin disease grew better, but after about a year it became worse, and the man at his own instance took from six to nine thyroid glands daily. After one week he became delirious, exceedingly restless, would eat nothing, and ran into the street naked. He thought he was followed by enemies. With this there was marked tremor, rapid heart action, and swelling of the thyroid gland. The severe symptoms lasted only four or five days, but the patient was still somewhat confused mentally, and the thyroid symptoms still persisted in lesser degree. After six weeks he seemed to be practically well except for anaemia and a severe dermatitis. He then began again to take thyroid glands secretly, and his mental disturbance and thyroid symptoms reappeared, but this time were overcome after a week's treatment.

In spite of the attempts to make nervous changes responsible for the disease, all satisfactory evidence points against this. Still, a number of authors insist that the disease is chiefly dependent upon nervous changes, though their evidence consists chiefly of inconclusive clinical observations.

H. J. Vetlesen,² in discussing exophthalmic goitre, expresses his belief that the cause of the alterations in the thyroid is some change in the nervous system.

A. Pader³ reports a case of exophthalmic goitre with hysteria, and directs attention to the frequent occurrence of similar symptoms in the two diseases. He states that he believes that both hysteria and exophthalmic goitre have the same cause. He thinks it possible that the

¹ *Revue Neurologique*, July 15, 1899.

² *Zeitschrift für klin. Med.*, Band xxxvii., Heft 5 and 6.

³ *Thèse de Paris*, 1899.

secretion of the thyroid produces hysteria when the function of the gland is abnormal, in the same way that alcohol and other poisons sometimes produce hysteria. L. N. Robinson¹ also considers Graves' disease hysteria.

That nervous symptoms are very prominent is undeniable, as is the fact that the disease tends to occur most frequently in those of neuropathic habit and ancestry. Yet this does not provide any further proof than that such persons are extremely susceptible to the causes which produce the disease.

It is merely straddling the difficulty to state, as P. Londe² does, that the symptoms in exophthalmic goitre are in many cases dependent purely upon nervous changes, and that the muscular and cardiac weakness are entirely the result of such nervous alterations, while in others he thinks that the disease of the thyroid gland is the chief factor in the case.

The frequency of nervous symptoms and even of mental changes has led to a belief in some quarters that a specific insanity occurs with exophthalmic goitre. A. Homberger³ does not consider this to be the case, and thinks that all forms of insanity may be seen with this disease. He gives histories of 20 cases with melancholia, 18 with dementia, 6 with progressive paralysis of the insane, and smaller numbers with various other forms of insanity; also 17 cases of neurasthenia and mental changes, 6 with hysteria, and 6 combined with epilepsy.

G. Carter⁴ believes that the cause of Graves' disease is an organic poison, perhaps produced by amoebæ, and that perhaps one is justified in drawing an analogy between exophthalmic goitre and malaria.

It does not seem to be unfair to say that such statements are based upon speculation or wholly inconclusive observations, and more harm than good is likely to result from them.

Symptoms. A few cases with unusual features have been recorded. W. Uhthoff⁵ describes a notable case with necrosis of both cornea. The patient was a man, aged twenty-seven years, who had shown symptoms of Graves' disease for five months. Both eyes became swollen and painful, and the lids could not be closed. Ulcers developed on both cornea, and both of them perforated. Uhthoff had seen the complication twice before.

Popoff⁶ reports two cases of exophthalmic goitre which were complicated by hemorrhages from many of the mucous surfaces as well as

¹ Thèse de Paris, 1899.

² Revue Neurologique, 1899, p. 788.

³ Inaugural Dissertation, Strassburg, 1899.

⁴ Edinburgh Medical Journal, 1899, p. 343.

⁵ Allgem. med. Zeitung., 1899, No. 37.

⁶ Neurologisches Centralblatt, 1899, No. 22.

from the skin. Improvement of the exophthalmic goitre was followed by disappearance of the hemorrhages.

The probability of excessive secretion by the thyroid in this disease lends some reason to the thought that iodine might be found in the urine. J. Donath¹ was, however, unable to find iodine in the urine of either normal persons or persons with Graves' disease, and even after giving iodothyryin in doses which contained 1.8 mg. of iodine there was no iodine found in the urine. He decides that chemical methods now in use are not sufficient to determine the presence of less than 3 mg. of iodine in the urine. He described a case of exophthalmic goitre in which he had resection of the sympathetic done. Directly after the operation the pupil was contracted, and the corresponding side of the face became very red. The thyroid gland decreased in size on the same side, and the circumference of the neck decreased from 36 cm. to 33.5 cm. Six weeks later the other sympathetic was resected, and the exophthalmos on that side became less. The color and temperature of the two sides of the face were then similar, and both perspired equally. There was some general improvement, interrupted by periods of depression. After sixteen months the general condition was on the whole slightly improved, but the symptoms persisted.

Treatment. THYROIDECTOMY. The stand-point to be taken by the medical clinician in the question of operation will be made clearer by briefly considering the results of operation. (See also p. 17, in Vol. I., for 1900 for surgical view.—ED.) Rehn² collected the statistics of results from operations undertaken for exophthalmic goitre. The report is preliminary to a more extended article. He includes 177 resections of the gland, the result being 57.6 per cent. cured, 26.5 per cent. improved, 2.3 per cent. unimproved, and 13.6 per cent. died. There were 32 instances of resection of the sympathetic; 31.1 per cent. were cured, 50 per cent. were improved, 12.5 per cent. unimproved, and 9.5 per cent. died. Of 14 cases in which the artery was ligated 24 per cent. were cured, 50 per cent. improved, the remainder died. Resection is apparently the best operation. Narcosis should be avoided as much as possible.

A. Schiller³ describes four cases of exophthalmic goitre which had been operated upon. In the first case excision of the cyst caused rapid improvement, and the patient was once more able to take up her occupation as teacher. In the second case, that of a woman, aged forty-nine years, who had previously been melancholy, tying the right thyroid artery caused rapid improvement, and she became quite well. The

¹ Zeitschrift für klinische Medicin, 1899, xxviii., p. 169.

² Society report, Münchener med. Wochenschrift, 1899, No. 41, p. 1357.

³ Beitrag z. klin. Chir., 1899, vol. xxiv., No. 3.

latter operation was done in the third case, with some improvement, but with ultimate death a year later from heart failure. In the fourth case strumectomy was done, with death on the table from entrance of air into a vein.

Vetlesen¹ in four cases had resection of the thyroid done. The first case improved and finally became permanently well; the second case improved strikingly, but became worse later; the third case had slight temporary improvement; the fourth case improved decidedly, but became pregnant and was decidedly worse during the pregnancy.

J. H. Nicoll² reports a case of excision of the thyroid for exophthalmic goitre, the only anaesthesia used being cocaine. The symptom improved considerably, and the wound healed without difficulty.

The mortality after even the most satisfactory and least fatal operations is so considerable that it will be readily seen that surgical intervention is not to be advised unless the cases resist medical treatment and have decided impairment of their health and activity. In milder cases, particularly if their livelihood is not dependent upon good health, operation does not seem justifiable unless strongly desired by the patient. When social conditions necessitate improvement of the health and medical measures fail, operation may often be properly advised.

Several attempts have been made to provide an antidote for the intoxicant supposed to cause the disease or to introduce the substance that is lacking. O. Lanz³ treated cases of exophthalmic goitre with the milk of goats that had been deprived of their thyroid glands. His idea was that the poison of thyroid cachexia is probably found in the milk, and would have an antagonistic effect upon the poison in Graves' disease. Three patients were so treated. The first left the hospital after two weeks. At this time her pulse was much improved, she slept much better, the pulse was less rapid, and the goitre had decreased in size.

The second case was treated for nine weeks at home, and had improved markedly. The other case had been under treatment for only eight days, but was already much better.

A similar method of treatment was used by Burghart.⁴ In discussing the treatment of exophthalmic goitre with organic extracts he states that he followed the suggestion of Ballet and Enriquez, and used the blood of dogs that had had their thyroids removed and had become ill therefrom; also the blood of a case of myxoedema. In the latter instance 200 c.c. of blood were removed, mixed with salt solution, and allowed to stand in an ice-chest for twenty-four hours after the addition

¹ Loc. cit.

² Glasgow Medical Journal, vol. iii., No. 3.

³ Correspondenz Blätter für Schweizer Aerzte, 1899, Band. xxix., No. 23.

⁴ Deutsche medicinische Wochenschrift, September 21, 1899.

of chloroform; it was subsequently filtered and allowed to stand until it became a clear blood color; after several weeks it was used in doses of 20 to 55 c.c. Eight injections were given in all within eight weeks, without any unfavorable results, and with an increase in weight of seventeen pounds, improvement in the growth of hair, decrease of the exophthalmos, the sweating, and the tremor, and the heart became quieter and more regular. The tendency to profound languor had vanished, and six months after the beginning of the treatment the patient had gained twenty-three pounds. The cases treated by injection of blood or the dried alcoholic precipitate of blood obtained from dogs whose thyroids had been removed were three in number. One left soon after the treatment was begun and showed some improvement. The other two gained respectively fourteen and twenty pounds under the treatment, and other symptoms were much improved.

Boisvert¹ describes a marked case of Graves' disease which was treated with extract of thymus gland, using the thymus of the lamb, in doses of 15 to 25 grains per day. The patient began to improve within a few days, and after about three months had almost entirely recovered, the only symptom of consequence left being swelling of the thyroid.

The effects from this preparation have been very variable, however, and isolated reports of good effects are not of great importance.

Vetlesen² has found thymus gland sometimes useful and sometimes wholly ineffectual. He has had some good results from the use of sodium phosphate and sulphuric acid.

C. N. Allan³ offers a curious suggestion as to the treatment of the disease. His method is to administer bile by the mouth, hypodermatically and by injection into the thyroid. He believes that the bile is to a certain extent absorbed, and influences metabolism. He reports cases so treated. One of them, a woman, aged fifty years, had repeated attacks of exophthalmic goitre, and became severely ill during an attack of influenza. Allan observed that the fees were extremely poor in bile pigments. He gave bile after the three months mentioned, sterilized. The injections caused severe pain, anxiety, dyspnoea, and increase of the cardiac action. In spite of this the woman was given 48,000 grains of bile in five weeks; she believed that she had improved very greatly, and the symptoms seem to have become decidedly less marked. Another case also seemed to show decided improvement. The idea is a fantastic one, and presents little to recommend it.

C. L. Minor⁴ records two cases of exophthalmic goitre, one of which in particular had been extremely resistant to general treatment. Since both cases had marked gastro-intestinal symptoms, and both had been

¹ *Revue Médicale*, 1899.

² *Loc. cit.*

³ *Lancet*, August 26, 1899.

⁴ *Medical Record*, December 2, 1899.

careless in their habits of diet, he believed that they were due to gastro-intestinal autointoxication, and treated them with large injections of hot water. One case recovered entirely and the other improved greatly.

It has grown to be the fashion to call everything that is associated with gastro-intestinal symptoms and that improves upon treatment of the alimentary tract, gastro-intestinal autointoxication. It is quite possible that intoxication of this form may play some part in exophthalmic goitre, but this is unproven ; and that gastro-intestinal autointoxication is the main cause of the disease is, to speak mildly, highly improbable. The improvement in such cases as those last detailed is not surprising, but is not evidence that gastro-intestinal autointoxication caused the symptoms. It rather indicates that improvement of the gastro-intestinal tract caused betterment of the general condition and thereby of the exophthalmic goitre.

OPHTHALMOLOGY.

By EDWARD JACKSON, M.D.

DISEASES OF THE CONJUNCTIVA.

Conjunctivitis. In the literature of the past year, as in that of the year immediately preceding, the chief interest regarding conjunctival inflammations centres in their relations to the bacteria which share in their causation. Although the list of organisms causing conjunctivitis has been but little extended, our knowledge of these relations has been materially advanced. I believe that the confusion in our classification, which has seemed to arise from early observations in this direction, is already passing away and that our knowledge of these inflammations has now been rendered more practical as well as more scientific.

GONOCOCCUS CONJUNCTIVITIS. The practical bearing of the new knowledge can be illustrated by considering the facts learned regarding the influence of the toxins of the gonococcus upon the conjunctiva. Morax and Elmassian¹ experimented on the eyes of rabbits with live cultures of the gonococcus, with cultures in which the organism had been killed by heat, and with cultures from which the gonococcus had been removed by passage through a Chamberland filter. The gonococcus does not multiply in the conjunctiva of the rabbit, and the effects produced by the cultures containing the living and those containing dead organisms were the same. When the filtered culture fluid was used the effects were slightly diminished. The contact of either of these culture liquids, continued for two or three hours, caused hyperæmia with oedema of the bulbar conjunctiva and a fibrinopurulent discharge which lasted as long as the instillations were continued and for four or five hours afterward.

Experiments upon the human conjunctiva, both the normal membrane and that affected by trachoma, showed that the culture liquid, sterilized by heat or by filtration, produced here the same effects as upon the conjunctiva of the rabbit, the human eye being slightly more sensitive. Morax and Elmassian, therefore, conclude that gonococcus inflammation of the mucous membranes is due to a soluble product contained in the bodies of the microbes and diffused also in the culture liquid. This toxin

¹ *Annales d'Oculistique*, August, 1899.

is but little modified by any temperature below 100° C., but it is quickly destroyed by a temperature of 115° C. To obtain an active toxin, cultures must be made from the products of a virulent gonorrhœal inflammation or from a purulent ophthalmia running a malignant course. The effects of cultures from such sources differ very greatly from those of cultures taken from benign cases.

The practical importance of these observations lies in the fact that they place upon a scientific basis and explain and emphasize what some of us have come to urge from our clinical experience, that in the treatment of purulent conjunctivitis "the most important point is the cleansing of the eye of all discharges as frequently as this becomes necessary." Whether silver nitrate, protargol, potassium permanganate, or whatever else is used, the eye should be kept free from those toxin-saturated discharges, which, independently of the proliferation of the gonococcus, would in a few hours set up all the phenomena of a gonorrhœal ophthalmia in a previously healthy eye.

Fournier¹ recognizes and calls attention to a mild variety of gonorrhœal conjunctivitis which usually gets well without being treated. There are present redness of the conjunctiva, a lessened sensitiveness to light and a diminished lachrymation, symptoms which Fournier holds to be characteristic.

PURULENT CONJUNCTIVITIS FROM OTHER CAUSES. The association of the bacillus coli communis with purulent ophthalmia has been noted by several observers. Groenouw² found it in six cases of ophthalmia neonatorum out of forty he examined, though in these it was associated with other organisms. A. Bietti³ reports a case in which the colon bacillus was the only micro-organism found. The child, otherwise healthy, presented the day after birth all the usual symptoms of a blemorrhœa of moderate severity, affecting the right eye only. The conjunctival discharge was subjected to microscopical examination and to culture tests, and showed only the colon bacillus. The organism must, therefore, be given a place with staphylococci and the streptococcus pyogenes as an occasional cause of this disease. It must be remembered also that in exceptional cases conjunctivitis due to the other bacteria that are known to cause conjunctivitis, may assume very much the appearance of a purulent conjunctivitis, although, as regards the practical aspect of the case, the treatment and prognosis remain essentially different from those of purulent conjunctivitis.

TREATMENT OF PURULENT CONJUNCTIVITIS. The application of strong solutions of *silver nitrate* to the everted lids after the disease has

¹ Wochenschrift für Therap. und Hygiene des Auges, 1899, No. 30.

² Bericht xxvii. versamml. d'Ophtalmol Gessellsch., Heidelberg.

³ Klinische Monatsblatt für Augenheilk., September, 1899.

developed, and the dropping of a 2 per cent. solution of the same drug into the eye to prevent its development in the new-born, are measures sanctioned by such long and general experience that they must not be lightly discarded. Still, it should be recognized that they may do harm, and cannot be implicitly relied on. A. J. Abbe¹ reports a case of fatal hemorrhage from the conjunctiva, beginning within two hours after the instillation of a 6 per cent. solution of silver nitrate and ending with death from exhaustion about twelve hours later. The silver solution was used when the child was a day old, because of redness and swelling of the lids. There was no bleeding from other surfaces, no evidence of disease elsewhere, and no family history pointing to haemophilia. Cases of severe conjunctival hemorrhage following the use of silver nitrate have been reported by other observers, notably Nettleship, Pomeroy, and de Schweinitz, and points of hemorrhage are often evident a few hours after the application of a strong solution to the conjunctiva.

Some unfavorable results following the prophylactic use of the 2 per cent. solution, the Credé method, are brought out by N. L. Wilson,² who reports eight cases of conjunctivitis in the new-born following its employment. Four of these he considered cases of acute catarrhal conjunctivitis caused by the treatment. The others were cases of purulent conjunctivitis occurring in spite of it. In three of the latter the sight was lost by involvement of the cornea. In the light of such facts it is scarcely to be regretted that the movement to make the Credé method compulsory for all children born in public institutions has fallen short of actual legislative enactments. The agitation of the subject by keeping the importance of prophylactic measures before the profession has probably been entirely beneficial.

The question of whether the new organic compounds of silver can entirely replace the nitrate in the treatment of this disease cannot yet be decided. Wilson³ reports a case in which the thorough instillation of a 5 per cent. solution of *protargol* failed to prevent ophthalmia neonatorum. A. Messner⁴ has found *protargol* quite useful in both infants and adults. He commonly employs it in 5 per cent. solution. E. Praun⁵ thinks we have in *protargol* the best prophylactic against blennorrhœa neonatorum, the 10 per cent. solution of it giving, without irritation, a much more general effect than does the 5 per cent. solution of silver nitrate, even at the cost of severe irritation. Braunstein⁶ thinks that in blennorrhœa *protargol* does all that can be expected of a

¹ Annals of Ophthalmology, January, 1899.

² Philadelphia Medical Journal, February 11, 1899.

³ *Loc. cit.*

⁴ Centralblatt für praktische Augenheilk., January, 1899.

⁵ *Ibid.*, June, 1899.

⁶ Vratch, 1898, No. 42.

drug, shortening the treatment from four to six weeks to about that many days.

On the other hand, Lagrange¹ finds protargol quite inferior to silver nitrate in purulent ophthalmia. Galezowski² was not satisfied with protargol, for the ophthalmia gained ground under the protargol collyria and was not arrested until he resorted to brushing the lids with a solution of silver nitrate two or three times a day. He quotes observations to much the same effect on the part of Ginestons and Deschamps.

Regarding *argentamin*, Karl Hoor³ finds it of value equal in every respect to that of silver nitrate. He figures sections of tissues stained *en masse* with each of these drugs to show the greater penetrating power of *argentamin*. On the other hand, Clavelier,⁴ who tried solutions of *argentamin* of 2 to 10 per cent., found it inferior to silver nitrate.

Potassium permanganate has been used by Vian⁵ for purulent ophthalmia in the adult in much stronger solution than has commonly been employed. Twice a day he "cauterized" the palpebral conjunctiva with a 10 per cent. solution; the swelling and suppuration diminished rapidly, but a small ulcer formed on the lower part of the cornea and did not heal until after the cauterizations were suspended.

The above *résumé* regarding these different substances has been given somewhat in detail to illustrate the difficulties of judging of this subject and to enforce the unreliability of the experience that any one observer can yet have had with these new drugs. Recognizing this aspect of the case, my experience (wholly with protargol) and my reading lead me to this line of treatment for purulent conjunctivitis. After each cleansing of the eye, which may be required every half-hour, I instil freely a warm 2 per cent. solution of protargol and make free instillations of a 10 per cent. solution twice daily. But if under such treatment the condition of the conjunctiva does not improve quickly (in twenty-four or forty-eight hours) I use instead of the 10 per cent. solution of protargol a 2 per cent. solution of silver nitrate, but do not repeat its application until the mucous membrane has recovered the succulent appearance characteristic of the disease. The suggestion of Lagrange, to use for streptococcus infection the antistreptococcus serum, is also worth bearing in mind.

DIPHTHERITIC CONJUNCTIVITIS. Diphtheria of the eye is certainly of more frequent occurrence than was formerly supposed, but it is not so common as seemed to be indicated by some of the bacteriological

¹ *Annales d'Oculistique*, February, 1899.

² *Recueil d'Ophthalmologie*, April, 1899.

³ *Centralblatt für prakt. Augenheilk.*, May, 1899.

⁴ *Annales d'Oculistique*, February, 1899.

⁵ *Recueil d'Ophthalmologie*, August, 1899.

studies of the conjunctival secretions made before the bacteria which closely resemble the diphtheria bacillus had been carefully investigated.

H. Coppez¹ publishes an elaborate study of ocular diphtheria. He adds to the xerosis bacillus and the pseudodiphtheria bacillus of Hoffmann, the bacterium septatum of Gelpke, to form a group of organisms distinguishable from the true diphtheria bacillus only by culture or by inoculation experiments. For the diagnosis of ocular diphtheria he recommends the examination of cover-glass preparations, cultures on serum-agar, and use of the Ernest-Neisser double coloration. By these tests the diagnosis can usually be established on the day on which the case is first seen. Bouillon cultures and the inoculation of the guinea-pig may be reserved for control tests.

This seems to make the diagnosis of diphtheria of the eye a considerable undertaking. But nothing less than this can give results of any scientific value. The very general presence in the conjunctiva of the xerosis bacillus makes the mere microscopical examination of the discharges utterly unreliable for even a probable diagnosis. It is of far less value here than in diphtheria of the throat. In urgent cases the probable diagnosis based on symptoms should be taken as a basis for treatment until the careful bacteriological diagnosis can be completed.

Coppez finds that the corneal lesions occurring in the course of conjunctival diphtheria are always secondary; that there is no primary diphtheria of the cornea. The cases that have been reported as primary diphtheria of the cornea, or at least some of them, have been cases of corneal disease from other causes in which the finding of the xerosis bacillus has led to a false diagnosis. The corneal lesions seem to be due to the influence of the diphtheria toxins. Morax and Elmassian² found that the diphtheria toxin, to produce a reaction in the eye, had to be instilled for six or eight hours if the epithelium was intact, but that if the epithelium was in any way destroyed the time was very much shortened. In any case, however, the reaction did not become evident for a period of ten to eighteen hours, and did not reach its maximum until forty-eight hours, when the clinical characters of diphtheritic conjunctivitis were produced. From the third day after the instillation the symptoms diminished. This slow development of the symptoms is characteristic of the diphtheria toxin, and sharply distinguishes it from the toxins found in other varieties of conjunctivitis. Coppez notices the same thing in regard to the action of the toxin on the cornea, twenty-four or forty-eight hours elapsing before the effect upon the cornea is marked.

Morax and Elmassian found that the absorption of the toxin was not more rapid and its effects not much more severe when it was instilled

¹ Archives d'Ophtalmologie, October, 1899.

² Annales d'Oculistique, August, 1899.

in concentrated solution than when diluted, and Coppez found that it lost none of its virulence when mixed with the tears.

The great danger from conjunctival diphtheria is destruction of the cornea. Coppez from his study draws these two therapeutic indications for the protection of the cornea from friction and injury by the false membrane and from the depressing effects of the toxin : 1. Keep the conjunctival sac well coated with vaseline (petrolatum) frequently renewed. 2. Inject antidiphtheritic serum beneath the conjunctiva of the eyeball, and thus create a defensive zone all around the cornea.

These suggestions are reasonable and worthy of being acted upon, but they should not replace or overshadow in any way the importance, in every case certainly recognized as one of diphtheria of the conjunctiva, of giving as quickly as possible a full dose of the antitoxin to act through the general system. A second dose should be given if improvement is not noticed in twenty-four hours, if the case is seen early, or whenever there is manifest a tendency to relapse. If the antitoxin is given later in the case its effects are not noticed so quickly. Thus in a case reported by C. P. Pinekard,¹ antitoxin injected on the seventh day seemed to produce no improvement for over two days. In cases where diphtheria is suspected and the symptoms are urgent the first dose of antitoxin should be given at once, and an endeavor should be made to complete the diagnosis before a second dose may be called for. A few years ago Fuchs wrote of this disease : "In the confluent form of diphtheria the cornea is always irretrievably lost." Now, the published cases would almost justify the statement that by the early use of antitoxin the cornea can always be saved.

CROUPOUS CONJUNCTIVITIS. The tendency in the past has been to regard conjunctival inflammation attended with the formation of croupous deposit on the inner surface of the lids, easily separable from the conjunctiva and not associated with great swelling and induration of the lids themselves, as something totally different from ocular diphtheria. It was regarded as a condition liable to arise in the course of several varieties of conjunctivitis. That it may arise from various causes there can be little doubt, but recently there has been a general tendency to closely connect this form of conjunctivitis with diphtheria. In some cases there seems to be no better reason for doing this than the finding of a bacillus, which may be only the "xerosis" bacillus, in connection with the false membrane. In a large number of cases the reasons are more substantial. Coppez, carefully reviewing the subject, finds that no sharp line can be drawn between the lesions of these cases and those of pronounced ocular diphtheria ; that the symptoms, both local and

¹ Journal of the American Medical Association, May 27, 1899.

general, shade gradually into each other; that some cases of croupous conjunctivitis have been attended with fatal systemic poisoning; that others have been followed by post-diphtheritic palsies; that sometimes the croupous deposit in the eye has attended true diphtheria of the throat; and that in some cases the true diphtheria bacillus has undoubtedly been found. Gossetti and Iona,¹ in a study of twenty-nine cases of croupous conjunctivitis, found the diphtheria bacillus present in six.

I think Coppez establishes the identity of some of these cases as true ocular diphtheria, and there is the confirmatory evidence in the therapeutic test. For instance, A. D. McQueen² reports a case where the membranes twice re-formed after removal and were found to contain diphtheria bacilli, and there were general symptoms of diphtheria. He injected antidiphtheritic serum three times, each dose being followed by improvement, and the last by complete recovery. Clinically the case might have been regarded as one of simple croupous conjunctivitis. The separation of the false membrane left no bleeding points, and the ocular conjunctiva was not involved.

But we must remember that all or perhaps a majority of cases of croupous conjunctivitis are not diphtheritic in character. Neither are we justified in regarding them all as belonging among the urgent cases of doubtful diagnosis.

DIPLOBACILLUS CONJUNCTIVITIS. Although the discovery of the diplobacillus causing this disease was the origin of its recognition as a distinct clinical type, it is already one of the forms of conjunctivitis most certainly and easily recognized by its clinical characteristics. These characteristics have been well described by J. Eyre,³ A. Bietti,⁴ and J. Gonin.⁵ The onset is insidious, and one eye is commonly affected a few days before the other. The redness of the eyeball is slight, but the palpebral conjunctiva is intensely red and the commissures also are reddened. Bietti speaks of it as "angular conjunctivitis." If the case be severe and chronic the lower lid and skin near the commissures may become excoriated or eczematous. The discharge is slight, least in the day time, and is stringy and collects in small gray masses near the canthi. The pricking and burning it causes are worse toward evening. The swelling of the lids is usually slight. The disease runs a chronic course, lasting from two to twelve months if untreated or inappropriately treated. It tends to spread in families. These symptoms and the finding of the bacillus establish the diagnosis.

¹ *Annali di Ottalmologia*, xxvii., fascie. 1, 2.

² *British Medical Journal*, December 30, 1899.

³ *Journal of Pathology and Bacteriology*, May, 1899.

⁴ *Annali di Ottalmologia*, xxvii., 2.

⁵ *Rev. Médicale de la Suisse Romande*, 1899, 2, 3.

Gonin, in 365 cases of conjunctivitis examined bacteriologically at Lausanne, found this bacillus in 185, but this is a larger proportion than has been noted by other observers.

Bietti found it in thirty-four out of forty-two cases that were suspected from the clinical symptoms to be of this nature. Typical cases can be recognized with a good deal of certainty without any bacteriological examination.

Treatment. When we remember that this disease, tending but little toward recovery without this treatment, is cured in a few days by solutions of zinc sulphate or zinc chloride, the practical importance of recognizing it is easily seen. I have used solutions of zinc sulphate as strong as 5 per cent., but most cases yield quickly to a 1 per cent. solution instilled twice daily.

PNEUMOCOCCUS CONJUNCTIVITIS. In the series of examinations above referred to, Gonin found the pneumococcus in only eleven cases. This is in strong contrast to the findings of some other observers. Gifford found it the most frequent cause of acute catarrhal conjunctivitis in Omaha. My observations lead me to agree with Gifford. The pneumococcus is especially likely to be found in those cases of conjunctivitis that arise from "cold," irritation from dust, eye-strain, etc. Some writers have claimed that, like the "xerosis bacillus" and the staphylococcus, it is a very frequent inhabitant of the normal conjunctiva, but I cannot find any good basis for this, and Oertzen,¹ in a special search for it with microscopical and culture methods, in forty-nine cases only found it twice. The special circumstances that attend its appearance in the conjunctiva seem to indicate that here, as in the air-passages, it is only able to establish itself and multiply freely, when for some reason the resisting power of the tissues is temporarily depressed. Its toxin, separated from the living pneumococcus, was found by both Coppez and Morax and by Elmassian to produce quite an insignificant effect even when instilled constantly for several hours.

VERNAL CONJUNCTIVITIS continues to be very much of a puzzle both as to its pathology and its treatment. As having a possible bearing on the former, A. Angelucci² records the fact that patients who suffer with this trouble are all of an excitable choleric temperament, and liable to flushing of the head and face. He thinks that a circulatory predisposition to hyperaemia underlies the disease. Mandonnet reports³ a case in which the bulbar conjunctiva was found almost normal, but on each lower lid near the margin was found a band, elevated 1.5 mm., of papillomatous excrescences of firm consistency and red in color. The general

¹ Klinische Monatsbl. f. Augenheilk., November, 1899.

² Archivio di Ottalmologia, vol. v.

³ Annales d'Oculistique, April, 1899.

surface of the palpebral conjunctiva presented the bluish-white film characteristic of the disease. The excision of the band of excrescences gave relief from the corneal irritation it had caused.

Treatment. E. Bock¹ reports the trial in three cases of powdered xeroform with rapid improvement in all of them. The trial was made in the early summer, when the disease would be expected to grow worse, and each of the patients had suffered with it the preceding summers.

CONJUNCTIVITIS FROM THE HAIRS OF PLANTS. Ch. Markus,² of Göttingen, reports a case which may be compared to the "ophthalmia nodosa" caused by caterpillar hairs. The conjunctiva presented nodules covered with secretion, the removal of which disclosed in each nodule a protruding hair. The finger passed over the conjunctiva gave the impression of passing over a brush. The hairs came from a powder which the patient had carried that was largely composed of them. As far as possible each hair was extracted, and the patient recovered within a month.

Actinomycosis of the Conjunctiva. A case of this disease is reported³ by L. Demicheri, of Montevideo. The only previously recorded case, although reported by Vicentiis, of Naples, occurred in a patient who had lived in Buenos Ayres. Demicheri's patient, a young man, had suffered for several days with subacute conjunctival catarrh affecting both eyes, which was probably of no significance in the case except that it brought the patient under observation. Nothing uncommon was observed about the right eye, but on evertting the upper lid of the left eye there appeared along the posterior margin of the tarsal cartilage, chiefly toward the nasal end, about fifteen yellowish-gray granules 0.3 mm. or more in diameter. The appearance suggested a granular or follicular eruption, a miliary tuberculosis, or the infarcts of the Meibomian glands often seen in elderly persons, but their distance from the free border of the lid and the age of the patient negatived this latter view. Some of them were opened with a Graefé knife, and their contents, examined microscopically, showed the typical masses of actinomycosis. Excision of the focus of infection cured the patient.

Angioneurotic Oedema of the Conjunctiva. Under the name acute oedema of the conjunctiva, A. Terson⁴ reports a case of extreme conjunctival oedema developing in one eye of a woman aged forty-five years. The swelling was attended with redness, but with no pain or other evidence of inflammation and no exophthalmos. It developed in one day, lasted a day, and disappeared in two days more, leaving the eye normal.

¹ Centralblatt für praktische Augenheilk., July, 1899.

² Zeitschrift für Augenheilk., July, 1899.

³ Archives d'Ophtalmologie, February, 1899.

⁴ Recueil d'Ophtalmologie, January, 1899.

The patient gave the history of a similar attack in the other eye two years previously. A. Duane¹ reports a case lasting but half an hour, which occurred in a girl, aged eight years, the attack being chiefly one of vascular dilatation rather than oedematous swelling.

A few cases of this kind have been previously recorded. They are of interest chiefly because of their resemblance to very grave inflammatory disease. The absence of pain or conjunctival secretion, with the normal appearance of the cornea, iris and pupil, should indicate the character of the attack. Angioneurotic oedema of the skin of the lids accompanies oedema of other parts of the face. Such a case is reported by H. F. Slifer.² It might also accompany the oedema of the conjunctiva. Duane mentions in his case a "fixed blush on each cheek just below the eyelid," which disappeared with the conjunctival redness and swelling.

Symblepharon Relieved by Skin-grafting. The ophthalmic literature of bygone years is strewn with reports of attempts, by interposing mechanical obstacles after their division, to prevent the reunion or reformation of the cicatricial bands uniting the lid to the eyeball. Shields of glass, porcelain, lead, or silver were inserted, to be worn for a time, but finally to be forced out by the unconquerable tendency of the tissues to cicatricial contraction. Finally well-informed surgeons realized that no good permanent result could be obtained unless the raw surfaces created could be covered with epithelium, and they turned their attention to the transplantation and grafting of mucous membrane and skin.

The difficulty with grafts was to keep them accurately in place until they should "take." Within the last two or three years the old mechanical appliances have been resorted to again, not to resist the cicatricial contraction, but merely to hold the grafts in place until they are firmly connected to the underlying tissue, and it looks now as if the operative treatment of symblepharon had been placed on a more satisfactory basis.

C. H. May³ reports a case of total symblepharon in which he restored the conjunctival sac by means of Thiersch skin-grafts. This was done in three operations, and the result remained entirely satisfactory eight months after the third operation. The lining of the lids remained smooth, soft, epidermoid, with no desquamation and little discharge. To keep the grafts in place a porcelain shell, such as forms the basis of the artificial eye, was used. Two large Thiersch grafts, shaved from the thighs, were applied over this shell, completely covering both surfaces. By placing the shell in the dissected cul-de-sacs the grafts were applied.

¹ Ophthalmic Record, April, 1899.

² Philadelphia Medical Journal, July 29, 1899.

³ Archives of Ophthalmology, March, 1899.

They were kept in place by stitching together the lids enclosing the shell, after which a firm bandage was applied.

May says that the grafts should be as large as possible and that two or three ought to be sufficient to line both upper and lower lids. They should be about 50 per cent. larger than the area to be covered, to allow for shrinkage. They must not be handled, but must be transferred from the back of the razor to the shell and spread out as smoothly as possible with the epithelial surface next to the shell. A defect may be left over the centre of the inner surface of the shell, corresponding to the cornea, but the edges must be well covered. Stitching the grafts is unnecessary and inadvisable. If all goes well the bandage should not be removed for five days, at which time the lids are cleansed and the stitches removed from them. The shell should remain for eight days, and may then be removed to irrigate the sac, but it should again be replaced, and the bandage continued. If the cornea is transparent it is important to watch it, and for this purpose May suggests the use of a shell of transparent glass.

F. C. Hotz¹ reports a case of total symblepharon of the upper lid treated in much the same way. As he did not have at hand a shell of the proper shape, he cut from a thin sheet of lead an oval disk of the proper size and then moulded it to fit accurately the whole space to be lined with epithelium. The lids were stitched together for four days, and on removal of the plate the grafts were found united throughout. The plate was reapplied for four days longer, but the bandage was omitted.

The carefully prepared lead plate is certainly the more generally available means of retention, and it seems to me in every way the better device. If it is necessary to watch the cornea a hole can be cut through the plate for that purpose, and the cornea can thus be entirely removed from the dangers of friction and pressure.

DISEASES OF THE CORNEA.

Corneal Ulcer. Last year I discussed the evidence of serpent ulcer being due to the pneumococcus, and this view is confirmed by several important communications published during 1899. Druaut and Petit² report the anatomical examination of a case of typical serpent ulcer, following traumatism, with abundant hypopyon and severe pain, and without any disease of the lachrymal passages. They found the pneumococcus in pure culture, the colonies pushing their way between the layers of the true corneal substance, while the epithelial layer was comparatively uninjured. The persistence of the epithelial cells, they think,

¹ Ophthalmic Record, November, 1899.

² Archives d'Ophthalmologie, July, 1899.

shows a special power of resistance on their part, so that without some injury of the epithelial layer the pneumococcus is unable to pass through it. Coppez¹ tried the experiment of injecting cultures of the pneumococcus into the anterior chamber, and of submitting the cornea after its epithelium had been destroyed by the actual cautery to their influence. He concludes that there must be a lack of destructive energy in the toxin itself, and that to cause a corneal lesion it is necessary to introduce the living microbes.

P. Petit,² while agreeing entirely with other observers that the pneumococcus is the usual cause of serpent ulcer, reports two cases in which this form of ulcer slowly developed in connection with disease of the lachrymal passages without pain or involvement of the iris, but with hypopyon. He found present in both cases a bacillus somewhat resembling the diplobacillus of Morax and Axenfeld, but distinct from that bacillus. It is decolorized by the Gram method, grows well on ordinary media, liquefies gelatin and coagulated beef-serum, and is non-pathogenic to animals. The ulcers were more benign than the pneumococcus ulcer, but they left corneal opacities.

The pneumococcus ulcer is not yet definitely recognized by most systematic writers, and under the names serpiginous ulcer, suppurating keratitis, and hypopyon ulcer it is classed with cases due to staphylococcus or streptococcus infection. This confusion is not surprising when we consider the general similarity of their clinical characteristics, and this similarity is in part explained by what has been learned regarding their bacteriology. Thus Morax and Elmassian found that the staphylococcus toxins produced no lesions of the cornea, and with the streptococcus toxin (even some of the most active furnished them by Marmorek, such as he used in the preparation of antistreptococcal serum) provoked no reaction within the eye, even when instilled for seven hours. Coppez, too, found the toxin of the streptococcus as harmless to the cornea as that of the pneumococcus.

The state of our knowledge, then, is about this: Most cases of serpent ulcer, including all the typical cases, are due to the growth of the pneumococcus between the layers of the true corneal tissue. Other organisms, especially the staphylococcus and streptococcus, cause lesions more or less similar, and so far as we now know all of these ulcers are best treated in much the same way.

TREATMENT OF CORNEAL ULCERS. Under the heading of "Serpent Ulcer of the Cornea and Its Treatment," M. Haken³ gives the methods employed and the results obtained for this whole class of cases in the

¹ Archives d'Ophtalmologie, October, 1899, p. 611.

² Annales d'Oculistique, March, 1899.

³ Klinische Monatsbl. f. Augenheilk., April, 1899.

eye clinic at Wiesbaden. The results obtained were distinctly bad. In ninety-one cases but one recovered with full vision and but ten with vision of one-half or over. This is explained by the unfavorable class of cases treated and their unhygienic surroundings. In the last twenty cases subconjunctival injections of a 1 per cent. solution of common salt were employed with moist heat, atropine, and in the more severe cases Saemisch section of the cornea. The salt injections were in many cases followed by rapid improvement, and their influence on the general course of these cases seemed decidedly beneficial.

Haken's paper mentions about every remedial measure generally employed for corneal ulcer except the one which I have used most frequently and with the greatest benefit: the thorough curetting of the ulcer with the forcible scraping of the infiltrated edges from the sound tissue toward the ulcer. What we have learned of its bacteriology indicates that the destruction of the colonies of bacteria invading the sound tissue at the margin of a serpent ulcer is the most important thing to accomplish. Thorough curetting does destroy them in the majority of cases, and it is only surpassed in efficacy by the actual cautery. If I can see the case one or more times a day I usually prefer curetting, and this can be repeated at every visit if a careful examination of the ulcer shows any point at which infection is extending. But if the patient cannot be seen again for two days or longer the cautery is safer. The application of the cautery should destroy every particle of infected tissue. If it does, the course of the disease is cut short at once, but if any centres of infection are left they will extend considerably before they can be certainly distinguished from the slough left by the cautery. The necessary heat I have applied to the tissues with the galvano-cautery or with a platinum wire, or with an ordinary needle heated in a lamp flame.

A. Bourgeois¹ approves of the cautery, which he applies with an olive point heated to a dull red. A white heat is better because it does its work of destruction more quickly and with less damage to neighboring tissues.

Bourgeois says that sterilization of the ulcer by hot air is still better. He employs the instrument used to sterilize dental cavities with hot air. It is a blow-pipe heated in the flame of an alcohol lamp; the air which is thus heated is then blown through the pipe two or three times upon the ulcer. The eye is covered with a non-conducting shield in which is an opening for the tip of the blow-pipe. It seems to me rather remarkable that the heat carried by the air should have sufficient penetrating power to destroy the bacteria in the tissues, but Bourgeois says he has

¹ *Annales d'Oenlistique*, July, 1899.

used this method for a year without cause to regret it, having applied it upon eighteen patients with but one failure. It is worthy of a careful trial.

As a perfectly manageable and usually painless method of cauterizing the cornea, J. S. Johnson¹ recommends the application of nitric acid. A 10 or 15 per cent. solution of the pure acid is used. A point of suitable shape is made of some soft, fine-grained wood. This is thoroughly saturated with the diluted acid, and all excess is carefully removed, as no drops must be left hanging. The eye is anaesthetized and the saturated point deliberately pressed against the ulcer, its effect being carefully watched and judged by the whitening of the tissue under the influence of the acid. The eye is then to be washed with water or with salt solution. Johnson does not offer this method to replace the electro-cautery but as a valuable addition to our somewhat limited resources for combating corneal ulcers. It certainly will be available at times when the electro-cautery is not.

The bactericidal action of holocain and the fact that it does not unfavorably affect the nutrition of the cornea have naturally suggested the propriety of its use when local anaesthesia is required in a case of corneal ulcer, as for scraping, the application of the cautery, or the Saemisch operation. Hasket Derby² has gone further than this, and has applied a solution of holocain for its direct influence on the morbid process, and the application was followed by rapid, permanent healing. At his suggestion Myles Standish and R. H. Derby tried the same treatment with similarly good results. William F. Norris³ reports that in a number of cases which for many weeks had dragged along with slight progress and frequent relapses, great improvement was manifested from the use of holocain, as shown by rapid diminution of the infiltration area, and later by healing of the ulcer. The method of application was by flushing the conjunctival sac with a 1 per cent. solution, and by touching the floor of the ulcer with a cotton swab saturated with it. H. F. Hansell used holocain constantly for several weeks in a case of neuro-paralytic keratitis, securing relief of pain and the healing of the ulcer. G. E. de Schweinitz has used it in hypopyon keratitis with decided advantage. My own experience with holocain indicates that it is quite free from the dangers that beset the use of cocaine and that it is a very valuable adjuvant in the treatment of corneal ulcers, but it does not take the place of the more radical surgical procedures that are used in combating infected ulcer of the cornea.

For the permanent relief of the pain attending some corneal ulcers

¹ American Journal of Ophthalmology, July, 1899.

² Archives of Ophthalmology, January, 1899.

³ Ophthalmic Record, June, 1899.

we cannot entirely rely on holocain. For a painful relapsing ulcer, A. Darier¹ used an ointment composed as follows:

Orthoform	4
Petrolatum	30

One grain of this was placed in the conjunctival sac and a compress bandage applied. The burning pain it caused was at first very severe, but soon the eye became entirely comfortable and remained so until the next morning. Under this treatment the cure was complete in a few days, and no relapse had occurred in four months.

The entire safety of using orthoform in keratitis is questioned by C. R. Gardner,² who had a case of corneal ulcer in which he applied to the conjunctiva, several times a day, an ointment containing 5 per cent. of orthoform. The ointment seemed to relieve pain entirely for about two hours after its application, but on the fourth day a faint gray line of infiltration was noticed on the lower part of the cornea. This line extended until the sixth day, when the orthoform was omitted, and a rapid change for the better followed.

In the treatment of hypopyon keratitis E. Zirm³ dusts the ulcer three times a day with xeroform. He finds that for this purpose it possesses all the advantages of iodoform and airol, forming a coating over the surface that hinders the invasion of bacteria, while it is less irritating than the other substances mentioned. Zirm has given up the Saemisch section of the cornea through the ulcer and makes a paracentesis near the lower margin of the cornea instead. He found that when the eye had been "saved" by the Saemisch incision, as it often was, he had to do an iridectomy on account of the anterior synechiae, or the eye was lost through secondary glaucoma. This latter observation of Zirm's is important. The incision of the cornea at its lower periphery is altogether preferable to an incision directly across the ulcer. That it is quite as efficient and is far less liable than the Saemisch section to result in dangerous anterior synechiae, I can testify from a good deal of experience with it.

In the University Eye Clinic at Berlin, H. Schultz⁴ reports that chlorine water is used almost exclusively as an antiseptic collyrium in all forms of suppurative keratitis. It is usually instilled simultaneously with atropine, sometimes hourly. It should be perfectly fresh, because after standing it loses its efficiency and becomes irritant. In large ulcers with much secretion the surface of the ulcer is often dusted with iodoform, but this is not well borne by all patients. The above and a

¹ *La Clinique Ophthalmologique*, April 25, 1899.

² *Ophthalmic Record*, November, 1899.

³ *Wiener klinische Wochenschrift*, March 2, 1899.

⁴ *Archives of Ophthalmology*, September, 1899.

dressing moistened with 1 : 5000 sublimate or a boric acid solution constitute what Schultz calls their "medicinal treatment," and about one-half of all their cases of suppurative keratitis recover under this treatment alone.

Cassaripe, mentioned last year for the treatment of corneal ulcers, has been reported upon by J. A. Donovan.¹ His experience with it has been generally favorable. It diminished the formation of pus and relieved the pain. In one case, however, it seemed to aggravate the pain. Donovan used it in an ointment, in strengths of 10, 15, and 20 per cent., applied three times a day.

Interstitial Keratitis. At a meeting of the Société d'Ophtalmologie de Paris,² January, 1899, A. Terson presented two cases of interstitial keratitis occurring in the course of acquired syphilis. One case was that of a woman, aged twenty years, infected two years before, whose cornea had been like ground-glass but had nearly cleared up. The pupil dilated well with atropine, but showed two small synechiae. The other patient, a woman aged forty years, had had syphilis for twenty years, and the pupil was tightly bound down to the lens capsule. In both cases the keratitis was monolateral. Valude also reported a case of a young woman in whom first one eye was affected and subsequently the other. Interstitial keratitis is not very rare as a lesion of acquired syphilis, occurring in cases long untreated or treated inefficiently during the early stages of the disease. It is more amenable to antisyphilitic treatment than when it is caused by congenital syphilis, but, as one of Terson's cases illustrated, it may be quite rebellious to treatment.

Parenchymatous keratitis is regarded by some writers as identical with interstitial, but there is a growing tendency to apply the terms to slightly different classes of cases, the latter term being applied to the syphilitic typical cases that are marked by general clouding of the cornea with subsequent general clearing up, the former to the more localized opacities from various causes, which do not run so regular a course to resolution. Under the name parenchymatous keratitis S. Schultz³ reports a case of corneal disease occurring with tubercular iritis. The case did badly under antisyphilitic and local treatment, and after a few months the eye was enucleated. The typical tubercular structure was found about the angle of the anterior chamber, with a few tubercle bacilli. The patient showed no signs of active tuberculosis, although he had had pulmonary hemorrhages six years before.

Grand Clément⁴ reports a case of "parenchymatous" keratitis in a girl, aged seventeen years, suffering from myxœdema, but who also pre-

¹ Ophthalmic Record, November, 1899.

² Archives of Ophthalmology, July, 1899.

³ Annales d'Oeulistique, January, 1899.

⁴ Annales d'Oeulistique, October, 1899.

sented typical Hutchinson teeth. Under the administration of thyroid extract the symptoms of myxedema rapidly disappeared, but the patient became quite blind from the corneal disease. At this time she was placed under treatment by massage of the eye. Every hour a little yellow ointment was put in the eye, and the eyeball was rubbed energetically through the closed lids for fifteen or twenty minutes. At the end of ninety days she was quite cured. Grand Clément takes occasion to exploit the value of this mode of treatment. Many of us have tried massage in this condition with results more or less satisfactory, but I do not know of anyone else who has undertaken to devote one-fourth or one-third of his patients' waking hours to its vigorous application.

The observation of von Hippel that a solution of fluorescein instilled in the eye produces in parenchymatous keratitis a staining of certain points of the endothelial layer of the cornea, has been confirmed by W. Bihler.¹ The staining is supposed to indicate lesions of this layer. It is noticed that such power of staining is lost shortly before the cornea begins to clear up. The same staining was produced in sympathetic ophthalmia and inflammatory glaucoma, but was absent in simple glaucoma. It is suggested as a valuable test for the early recognition of sympathetic disease.

Neuropathic Keratitis. While I discussed the pathology of this condition a year ago, a contribution of such positive interest has been made to the subject by F. Seydel² that it merits notice here. He believes that it is most nearly similar to the neurotrophic lesions that follow destructive lesions of the spinal cord, or the perforating ulcer of the foot which occurs with tabes dorsalis. He suggests that there occurs a paralysis of the cervical sympathetic, of which he finds evidence in some of the reported cases and in the cases which he has studied, but the vasomotor paralysis thus produced is not sufficient alone to produce the corneal lesions. The nutrition of the cornea is not seriously disturbed until some affection of the trigeminus lowers its sensibility. Then tissue necrosis begins, and the well-known symptoms of the disease appear. Seydel found no recorded case in which paralysis of the sympathetic alone had sufficed to develop the corneal lesions.

Malarial Keratitis. Some writers have doubted whether the corneal affection described under this name by Kipp in 1880 really had any essential connection with malarial poisoning. An important contribution is made to its scanty literature by E. C. Ellett,³ who reports ten cases, in all of which careful blood examinations revealed evidence, and in which there was also a clear history of malarial infection. He admits

¹ *Münchener medicinische Wochenschrift*, August 8, 1899.

² *Graef's Archiv f. Ophthalmologie*, vol. xliii, part 1.

³ *Ophthalmic Record*, March, 1899.

that, malaria being the most common of diseases in the locality of his practice (Memphis, Tenn.), such a connection might have been more or less accidental, but he has never encountered any case of such keratitis complicating any other infection. I have never practised in or near a malarious district, yet the very few cases of this disease that I have seen have all come from such regions, with a clear history of one or more malarial attacks. Ellett writes of this affection as identical with the dendritic keratitis described by Hansen-Grut. But this identity is not certain. It is certain that the disease under consideration is quite distinct from the post-febrile corneal herpes of Horner.

Ellett has not seen any vesicles in his cases, but finds that the disease begins with a narrow elevated line which in two or three days becomes

FIG. 65.



Congenital opacity of both corneas. (MURPHY.)

a shallow ulcer, broadening and extending in branches. The original line and later the floor of the ulcer present small white points. When the epithelium is broken, fluorescein does not always stain the exposed tissue. He has not seen recovery in less than ten days, and the condition may persist several weeks. Relapses are not uncommon. The first indication for the treatment is to arrest the malarial paroxysm by quinine, or for chronic malaria to use Fowler's solution. The local treatment is usually comprised in protection of the eye and a mild antiseptic wash, but for sluggish ulcers pencilling with silver nitrate or carbolic acid, curetting, or the application of the cautery may be required. Ellett does not report a symptom mentioned by Kipp, one which I have always noted, viz., reduced sensibility of the cornea, which may be confined to the part on which the ulcer is situated.

Corneal Opacities. Congenital opacity of the cornea without other grave defect of the eye may simply mean an arrested or delayed development. The cornea is originally not transparent, and when its transparency has not been acquired before birth it still may come in fair degree later. F. G. Murphy¹ reports two cases of this kind. In one case (see Fig. 65) the corneas were said to have been as white as the sclera until the child was several weeks old, yet at seven years of age they had so far cleared up that vision was about 20/LXX in each eye, and the patient could read large type, play with other boys, and go about the city alone. This improvement occurred without any treatment. In the other case the cornea ultimately became normally transparent, but dissection of the lens was begun when the child was fourteen days old by a "travelling oculist," from the results of which it remained blind.

ARCUS SENILIS, so called, is generally thought of as a symptom of old age, but there are cases observed in early life and even in childhood. The early appearance of this condition may prove an annoyance. W. L. Bullard² reports the case of a woman, aged thirty years, who insisted on having something done for a well-developed opacity of this kind. By tattooing the cornea with India ink a result was attained that remained perfectly satisfactory for the three years which the patient continued under observation.

Tattooing of the cornea, however, should not be undertaken lightly or without warning the patient that it is attended with possible danger. A. Trousseau³ reports a case in which it resulted in complete blindness from sympathetic ophthalmitis. The patient, a young man, came first with an adherent leucoma, but with vision of 1/x, to ask advice about having the leucoma tattooed. Trousseau advised against it, but the patient went elsewhere, had it done, and returned with the eye blind from resulting iridocyclitis. He was advised to have the eye removed. He refused to have this done, went away, and returned a few weeks later with the other eye blind from sympathetic inflammation. Trousseau has seen another case in which sympathetic ophthalmia followed tattooing of a cornea for non-adherent leucoma.

Transplantation of the cornea of a rabbit has proven of some benefit in a very small class of cases. It is useless if the posterior limiting membrane of the cornea has been broken, because the transplanted cornea ultimately becomes opaque, and very few cases of corneal opacity dense enough to justify such an operation, and not amenable to other methods of treatment, occur without some break in Descemet's membrane. A somewhat different operation, which, if successful, will have a rather wider

¹ Ophthalmic Record, March, 1899.

² New York Medical Journal, April 15, 1899.

³ Annales d'Oculistique, March, 1899.

range of application has been tried by Wolffberg.¹ To get vascular attachments the conjunctiva was first undermined all around, and then drawn over the cornea with a tobacco-pouch suture. Next day a circle 3½ mm. in diameter was removed from the centre of the cornea, throughout its whole thickness, with the corneal trephine. Then the anterior portion of the eye of a sparrow, the part in front of the iris, including a strip of sclera all around the cornea, was introduced beneath the overlapping conjunctiva. The sutures were removed at the end of five days. The transplanted cornea retained its transparency and the scleral rim around it also cleared up. At the end of a month the patient could see well enough to go about in a good light, but this is too soon to judge as to the ultimate result.

DISEASES OF THE IRIS AND CILIARY BODY.

Iritis. The connection of iritis with certain constitutional conditions is of such practical importance that it is right to fix attention upon it on every occasion. R. Brunson² has tried to find out how often this lesion occurred in a given number of cases of syphilis and rheumatism. Taking cases as they come to Hot Springs, Ark., he found that among 1500 cases of syphilis forty-eight gave a history of iritis, and among 1500 sufferers from rheumatism there had been twenty-three cases of iritis. As he does not state what proportion of the syphilitics had passed the stage during which iritis is likely to appear, and as it may occur in any stage in rheumatism, we may fairly suppose that of each class additional cases of inflammation of the iris may still occur, although the proportions found by Brunson are higher than most writers have given.

Brunson believes that if syphilis is actively treated from the time the initial lesion is first seen not one patient in 500 will suffer from iritis. He selects the following points, with the history of the case, to make the diagnosis between rheumatic and syphilitic iritis:

RHEUMATISM.	SYPHILIS.
Photophobia, lachrymation and pain marked.	Not marked.
Condylomata never observed on the iris.	Present in every case.
Iris often very bright.	Often very dull.
Exudative changes slight.	Very extensive.
Synechiae long and thin.	Broad and short.
Little tendency to pigment deposit on lens capsule.	Marked tendency to pigmentary deposit.

A case of MALARIAL IRRITIS is reported by A. Péchin.³ The patient, when nineteen years of age, had her first attack of malarial fever, became

¹ Wochenschrift f. Therapie und Hygiene des Auges, August 24, 1899.

² Ophthalmic Record, November, 1899. ³ Recueil d'Ophtalmologie, July, 1899.

eachetic with it, and had iritis of the right eye. Five or six years later she had a second attack of malarial fever, and with it iritis in the left eye. Twenty years later there had been no recurrence of the inflammation, and the vision of the eyes was one-half and two-thirds respectively.

IRITIS CAUSED BY NASAL DISEASE, although not common, has been reported with sufficient frequency to establish the connection with its cause. E. Lefrancois¹ reports a case in which two months' treatment of the iritis, after very thorough investigation of the patient's general health, had produced no improvement. He then discovered that while one nostril was healthy the other, on the side of the inflamed eye, was occupied by a cheesy mass bathed in foul pus. This was washed out, supposing it might contain a foreign body. No foreign body was found, but the nostril quickly became healthy. The eye immediately became less painful and rapidly recovered.

SUPPURATIVE IRITIS, always extremely serious, is especially disastrous after cataract extraction and similar operations. Vian² has seen four cases, three of which recovered under the use of mercurial inunctions. The importance of looking to the quality of the mercurial ointment Vian insists on, and he mentions a case which did badly under the use of a supposed mercurial ointment which on analysis was found to contain one-tenth mercury and four-tenths lead. A caution he does not mention, but which still needs to be insisted on, is: that the mercurial must not be pushed when it manifestly impairs the general condition of the patient. Disregard of this principle may do great harm in this very condition of suppurative iritis.

In the case of TUBERCULOUS IRITIS reported by S. Schultze,³ tubercle bacilli were found in the excised eyeball, but the patient remained in good general health for a year afterward. While one would not be likely to excise the eyeball for an ordinary iritis, the tubercular eyeball must be considered as one containing a new growth that threatens general infection, and so the life of the patient. The eye may be sacrificed, even when not especially painful or unsightly, if there be no clear evidence that the disease has already extended beyond it. The prognosis of tubercular iritis is rather bad, so that in a large proportion of cases enucleation of the eye is about the only remedial measure that seems worth resorting to. Still, a few cases recover spontaneously, the patient regaining good sight and retaining good, general health, and these give encouragement to further therapeutic investigation and effort.

Amman⁴ reported a case of tubercular iritis in which temporary ameli-

¹ Recueil d'Ophthalmologie, March, 1899.

² Ibid., June, 1899.

³ Archives of Ophthalmology, July, 1899.

⁴ Klinische Monatsbl. f. Augenheilk., May, 1897.

oration seemed to follow the introduction of powdered iodoform into the anterior chamber, and after enucleation a most careful search revealed no tubercle bacilli. By this case N. J. Weill¹ was induced to study the effects of this form of treatment upon tubercular iritis produced experimentally in rabbits. He finds that sterilized iodoform is slowly taken up from the anterior chamber, even if its borders are diseased. The drug exercises a mitigating influence, whether the tubercular matter is introduced at the same time or the iris is previously tuberculous. Iodoform inoculation may retard the tubercular invasion, and thus give time to build up the general system sufficiently to resist the invading bacillus. It is not incompatible with other remedies, but needs them as adjuncts. It is applicable in acute as well as in chronic cases.

I see no reason why the method should not be tried in any clear case of tubercular iritis that is growing worse under the usual treatment for iritis. Weill sterilized the iodoform by soaking it forty-eight hours in a 3 per cent. solution of carbolic acid, pouring off the acid, closing the mouth of the bottle with sterilized cotton, and drying off the iodoform at a temperature of 40° C. He introduced the iodoform through a canula passed through an incision in the cornea, made with the corneal lance.

Tubercular iritis usually occurs between the ages of five and twenty. A. Péchin, in an exhaustive study of the literature,² finds one case at the age of one year and one at the age of fifty-one. He speaks favorably of iridectomy with removal of the growth for that form known as granuloma of the iris, in which but a single limited mass is found. He cites a case of de Weeker's in which removal by iridectomy was practised after enucleation had been advised, and the child remained in good health with good vision seven years afterward.

Operations on the Iris. IRIDOTOMY. Extensive wounds of the cornea with incarceration of the iris are serious, not only because they give rise to permanent leucoma, but because of their liability to cause closure of the pupil and secondary glaucoma. Because of these dangers iridotomy to free the iris from the cornea is a more important operation than might be supposed from the comparative infrequency with which it is practised. L. de Weeker³ urges its importance, and points out the reasons why it should always be done with the forceps scissors (pince-ciseaux). He introduces these through a corneal incision made at right angles to the corneal scar. Thus in Fig. 66, *A B* represents the corneal incision. The pointed blade is made to pierce the iris, which is then

¹ Archives of Ophthalmology, March, 1899.

² Archives d'Ophtalmologie, December, 1899.

³ Klinische Monatsbl. f. Augenheilk., November, 1899.

divided along the horizontal dotted lines parallel to the scar. Ordinarily it suits better to divide the iris only on one side of the scar, as shown in Fig. 67.

The tension on the iris tissue is generally such that after an incision of this kind the gaping makes of it a very fair artificial pupil. F. M. Wilson¹ reports with photographic illustration a case in which a central and almost circular pupil was obtained by a simple incision. This was a case in which one pupil had been drawn up to the corneal incision after cataract extraction and in which the other eye was afterward lost by plastic iridocyclitis, probably of sympathetic origin from the operated eye. Yet after all this the iridotomy in the operated eye gave vision of 20 L. Wilson cites another case of an eye blind with sympathetic inflammation in which ten iridotomies were done with a small,

FIG. 66.



FIG. 67.



De Wecker's operation of iridotomy.

narrow knife. Nine of these gave no improvement of vision, but good perception of light persisted, and the tenth opened a clear pupil and gave vision of 5/CC.

IRIDECTOMY preliminary to cataract extraction is done partly to try the tolerance of the eye to operative procedures, and partly to lessen the injury inflicted at any one time. Experience shows that this is safer than to do iridectomy at the time of extraction. But even in this way the risk of fatal complication is not wholly avoided. R. L. Randolph² reports a case of preliminary iridectomy followed in three days by explosive intraocular hemorrhage (see Cataract Extraction) causing the loss of the eye.

DISEASES OF THE CHOROID.

Choroiditis. The causation of many cases of choroiditis is extremely obscure. Having failed to obtain with mercury and iodides the relief of cases in which no diagnosis of syphilis could be established, R. Brumson³ began the treatment of these obscure cases on other lines, and noticed the clearing up of the trouble under salicylates. He is, there-

¹ Archives of Ophthalmology, March, 1899.

² Ophthalmic Review, January, 1900.

³ American Journal of Ophthalmology, March, 1899.

fore, disposed to regard uric acid as an important factor in causation, and urges the careful examination of the urine for the relative proportions of urea and uric acid as an important point in the diagnosis of the puzzling cases of choroidal inflammation.

Metastatic Panophthalmitis. This disease is commonly referred to as a purulent choroiditis, but the septic emboli from which it starts may be lodged in the retina. It is very rarely examined ophthalmoscopically until the local process has so far advanced that discrimination between retinal and choroidal infection is quite impossible. Most of the cases are of puerperal origin. R. Saradeth¹ reports a case beginning on the twenty-first day after confinement, there having been rigors and high temperature from a retained fragment of placenta. By the fortieth day the more active symptoms of inflammation had passed away, but the right eye was blind, the cornea insensitive, and thick masses of pus appeared in the anterior chamber. Before this the patient's general condition had improved and her temperature had become normal. This result is exceptional; generally the involvement of the eye is confined to cases in which there is fatal involvement of vital organs.

B. L. Millikin² places on record three cases, one seen by himself and two seen by J. H. Lowman; in all of which the original disease proved fatal. One was in a case of typhoid fever, with ear pain, but no evidence of otitis media. The left eye was alone affected, and there was suppuration in the orbit. There was evidence of meningitis, and the patient died in coma two weeks after the eye symptoms appeared. The second case was also monocular. The cause was obscure, but probably septic endocarditis. The eye symptoms appeared on the fourth day of the attack, and the patient died on the sixth day. The third case was binocular, complicating pneumonia. The left eye was affected on the fourth day, the right eye on the fifth day. On the seventh day the blindness was complete, and death occurred on the eighth day.

Sarcoma of the Choroid. This is the most common primary intraocular malignant growth, except in very early childhood. Its early diagnosis is important, because of a more favorable prognosis if it is early removed. A. Alt³ reports a case in which the eye was removed eight weeks after the growth was first seen, before which a peculiar sparkling and a shadow before the eye had been noticed for several weeks. The patient's vision was still 20/xxx with this eye, the growth being situated at the nasal side of the optic disk with a corresponding scotoma. P. Silex⁴ reports a similar case in which the vision was equally good, 2/iii,

¹ Münchener medicinische Wochenschrift, March 14, 1899.

² Trans. American Ophthalmological Society, 1899.

³ American Journal of Ophthalmology, September, 1899.

⁴ Berliner klinische Wochenschrift, August 7, 1899.

in the two eyes; there was a myopia of 5 D., a small relative scotoma in the outer field, and a detachment of the retina inward and downward. After watching it two months Silex concluded that the case was one of sarcoma and enucleated the eye.

In the above cases the diagnosis rested upon the ophthalmoscopic symptoms alone, with absence of history or symptoms pointing toward syphilis, tuberculosis, etc. J. O. McReynolds¹ was able to add to the ophthalmoscopic symptoms the introduction of a hypodermic needle into the tumor, finding in this way that it gave the sensation to touch of a solid tumor and that it did not collapse by the escape of fluid. The above all proved to be cases of melanotic spindle-celled sarcoma.

A case of melanotic round-celled sarcoma in which the diagnosis was difficult for another reason is reported by M. L. Foster.² The patient, a woman aged forty-eight years, came with a recent iridectomy, the eye having been operated on at an ophthalmic hospital three weeks before. She had never had trouble until two weeks before the iridectomy, when sudden, intense pain attacked the eye. There had been some sight remaining up to the time of the operation. Now the eye was blind, intensely painful, and with tension of + T 3. The partially opaque lens prevented a view of the structures behind it. The eye was enucleated as the only thing likely to relieve the pain, but on examination it was found to contain a disk-shaped tumor about an inch in diameter.

Still another condition which may obscure the diagnosis is the existence of phthisis bubo in the eye in which the sarcoma develops. This was discussed last year.³ Another case of this kind is reported by F. Terrien.⁴ In some cases the sarcoma seems to develop in an eye previously injured and shrunken. In this case the history indicated that the eye had been the seat of glaucomatous changes and had become blind before the shrinking occurred.

The diagnosis between sarcoma of the choroid and glioma of the retina can usually be made by the age of the patient, but W. M. D. Carhart⁵ encountered a case of leucosarcoma in a boy four years old. However, the diagnosis of a malignant new growth will fit either case, and the rules governing the treatment of the two conditions are essentially the same.

The TREATMENT FOR SARCOMA OF THE UVEAL TRACT is excision. In what proportion of cases and under what circumstances the relief thus afforded is permanent are matters of great interest and practical importance. In 1891, Lawford and Collins published the results of a study of

¹ Ophthalmic Record, October, 1899. ² Archives of Ophthalmology, March, 1899.

³ PROGRESSIVE MEDICINE, 1899, Vol. II.

⁴ Archives d'Ophtalmologie, August, 1899.

⁵ Ophthalmic Record, January, 1899.

103 cases from the records of the Royal London Ophthalmic Hospital. Now C. D. Marshall¹ publishes the further history of the survivors of these 103 patients, so far as it can be learned, down to the present year, and to this he adds the history of fifty-eight new cases of enucleation for sarcoma.

Of the first group forty were dead in 1891, and nine have died since; two were suffering from recurrence when last heard from, and forty-six could not be traced. Six were known to be alive at periods varying from eight to seventeen years after operation, and five seem to have died of recurrence three years or more after the operation, one of them at eleven and one-half years from "local and general recurrence." Of the fifty-eight cases traced, fifty-two have died, thirty-four from recurrent disease, or 58.62 per cent. Of the fifty-eight new cases, eleven have survived the operation three years and upward, three of them for over seven years. Marshall's statistics prove what has been indicated before by isolated cases, that neither three years nor any other period of immunity can be regarded as a guarantee against future recurrence. They also bring out a point above referred to, viz., the age at which sarcoma occurs. None of the fifty-two patients whose age was recorded was under twenty, and the largest number (seventeen in one decade) occurred between sixty and seventy. A history of antecedent injury was only obtained in six cases, and in most of these the injury clearly had no connection with the growth of the tumor. A family history of "cancer" was obtained in four cases, but it was entirely indefinite and valueless.

SYMPATHETIC OPHTHALMIA.

Recent literature shows a growing appreciation of the fact that under the name sympathetic ophthalmia have been confused two entirely distinct affections, now called *sympathetic ophthalmitis* and *sympathetic irritation*. Donders recognized and pointed out that these were the two conditions, but he made too much of the fact that irritation may pass into inflammation, and other writers have treated sympathetic irritation as practically a mere prodrome of sympathetic ophthalmitis. Undoubtedly sympathetic irritation may pass into sympathetic inflammation, just as pneumonia may pass into pulmonary tuberculosis, but one does not therefore regard his cases of pneumonia simply as cases of impending phthisis. The pneumonia has its own special cause, dangers, and prognosis, quite apart from the tuberculosis that may follow. It is just so with sympathetic irritation. The symptoms of irritation may arise in connection with ophthalmitis, but this no more opposes the existence and

¹ Royal London Ophthalmic Hospital Reports, vol. xv., part 1.

independence of a distinct pathologic entity than does the occurrence of pneumonic symptoms in the course of phthisis.

It may be too much to expect this confusion to disappear entirely from ophthalmic literature until a generation of confusers has died off, but the discussion on the "Pathological Significance of Sympathetic Irritation and its Connection if any with Sympathetic Ophthalmitis," at the last meeting of the British Medical Association, will certainly clear up the subject to a considerable extent. In opening that discussion F. R. Cross¹ pointed out that the separation depends almost entirely upon the character of the symptoms, which he spoke of as "functional" in the one case and "inflammatory" in the other.

In sympathetic irritation they are "weariness of the eye and disinclination for use, uneasiness, tenderness or pain in the eye or orbital region, blepharospasm, lachrymation, hyperæmia of the conjunctiva, photophobia, museæ, and photopsias, dizziness or fogginess of sight, obscurations of longer or shorter duration, transient defects in the visual field, or even temporary blindness; spasm or weakness of accommodation, or abnormal pupil action. A slight redness or haze of the optic papilla may be present, but careful examination of the eye fails to detect any signs of intraocular inflammation." The functional nature of the disorder in sympathetic irritation and its complete curability are still most strikingly illustrated by the classic case reported by Donders of the man who believed himself entirely blind, and was, for all practical purposes, blind for two years, and yet two hours after the excision of the exciting eye the other had so far improved that it was proved to have normal vision.

As Cross says: "We cannot with certainty foretell what kind of a damaged eye will give rise to sympathetic mischief, or what one is perfectly free from risk of causing such complication." He has no doubt that a seriously damaged eyeball is prejudicial to its fellow, and may predispose it to various kinds of discomforts, if not diseases, and that one which possesses no useful sight should be removed or eviscerated, while a shrunken globe interferes with the safe wearing of a glass eye, and may at any time become a source of danger. A degenerated inflamed eyeball seems likely to make an excellent incubator for micro-organisms. Cross thinks it certainly damaging to the general health, which he has often seen materially benefited by its removal. The rules of conservatism should not be overstated in order to retain blind and often dangerous eyes. The removal of eyeballs for sympathetic troubles is a practice to be still further extended. An eye which is neither comely nor useful, and which is in any degree a possible source of mischief to its fellow, should be enucleated.

¹ Ophthalmic Review, October, 1899.

In the discussion which followed the reading of Cross' paper, his position regarding sympathetic irritation was indorsed¹ by all who spoke of it, including E. Landolt, M. M. McHardy, H. Caley, G. E. de Schweinitz, R. A. Reeve, and J. Hern. The clinical facts are so clear and so emphatic that there is little excuse for reporting cases of sympathetic "ophthalmia" in a way that makes it impossible to tell to which category they belong.

Sympathetic Ophthalmitis. So long as the pathology of this disease remains a puzzle the unusual cases that seem to throw light upon it from some new direction will have special interest and value. E. Gruening and W. B. Marple² report a case in which the wound, made by a piece of glass, was entirely within the cornea, but in which there occurred an extensive prolapse of the iris that was regarded as responsible for the involvement. Excision of the prolapse was not permitted by the parents of the five-year-old patient. Gruening thinks the dire result would in all probability have been avoided by a timely and cleanly excision of the incarcerated iris. Marple, who made the anatomical examination of the wounded eyeball, draws from it this lesson: "While one can safely affirm that not all perforating wounds of the cornea with prolapse of the iris will produce sympathy, still it would seem to be a wiser conservatism to free the iris in all such cases than to neglect it even in one and have as the result of such neglect the disastrous consequences of sympathetic ophthalmia."

Sympathetic inflammation from glioma of the retina without any history of injury is reported by A. Alt.³ The left eye was found to be blind when the child was two and one-half years old, and it became injected and painful a year later. Six months later this eye was removed by the family physician to save its fellow, but the latter continued to grow worse until when, a year later, the boy was brought to Alt it was quite blind. The left orbit was normal. The right eye presented photophobia, pericorneal injection, band-like opacity of the cornea, total posterior synechiae, discolored and atrophic iris, ciliary region tender, no fundus reflex, tension good, doubtful perception of light. Under treatment with mercury by injection and sodium iodide in three months the eye had improved so as to count fingers at six feet. Six months later the boy counted fingers at eight feet. But he looked badly, and in the left orbit was an elastic, round, yellowish tumor, which had been discovered a week before. Alt now obtained the enucleated left eye, and found it occupied by a glioma of the retina which had not broken

¹ British Medical Journal, September 23, 1899.

² New York Eye and Ear Infirmary Reports, 1899.

³ Trans. American Ophthalmological Society, 1899.

through the walls of the eyeball, but had extended along the optic nerve to where it was cut off.

The fact that unusual conditions, such as intraocular tumor, without operation or traumatism of any kind to the exciting eye, can excite sympathetic disease, indicates that the morbid influence of one eye over the other is a more general influence than that of a specific infection extending between them. The fact that the sympathetic disease may be a neurosis of pronounced type, so severe as to cause blindness without organic disease of the sympathizing eye, suggests that the connection between the two eyes is essentially nervous and functional. But the puzzle still remains to be solved.

Enucleation of the injured eye is often done with the hope of favorably influencing the inflammation in the other eye. R. Sattler¹ says that this practice has little or no foundation in surgical experience. I think he is quite mistaken. The proportion of recovery from sympathetic ophthalmitis is much larger after excision of the exciting eye than without excision.

DISEASES OF THE RETINA.

Albuminuric Retinitis. The retinal lesions attending chronic interstitial nephritis are of greatest interest on account of their prognostic significance. F. T. Rogers² makes a study of this condition based upon eighteen cases, of which four were still living. Three having been under observation for less than two years, he takes as his statistical basis the fifteen cases followed through the period of two years. Of these, ten died in the first year, thirteen were dead at the end of the second year, and only one lived more than three years. These statistics agree with those compiled by Belt (419 cases from various sources), who found that 72 per cent. died before the end of the first year and 90 per cent. before the end of the second year, while two had lived eight years, and single cases had lived nine and eleven years respectively.

The visible retinal lesions associated with albuminuria are placed by A. W. Stirling³ under five heads, viz., vascular changes, hemorrhages, white spots, exudations, and neuritis. The pathological changes which, if not always noticeable, probably underlie all others, are the changes in the vessels, and include thickening and degeneration of all the arterial coats. Hemorrhages are frequent and are generally minute but may be extensive. The white spots, although really preceded by vascular changes, are frequently the first visible lesions. Exudations are certain

¹ Ophthalmic Record, July, 1899.

² Ibid., September, 1899.

² Ibid., May, 1899.

to result because of the condition of the vessels and the increased blood-pressure. Exuded lymph may give rise to white spots that differ from those due to degeneration, chiefly in that they are less defined in outline and are raised above the normal level of the retina. Swelling of the optic disk with blurring of its edges is common, and sometimes the swelling may be great enough to bear a close resemblance to the choked disk of organic brain disease. Stirling has also called attention to the frequency of so-called physiological albuminuria, which he thinks is not physiological but postural, because it occurs chiefly during the first hours after rising in the morning. He points out that Eales found typical retinal changes in five out of fourteen cases of this condition.

S. West¹ undertakes to group cases of albuminuric retinitis into two rather distinct classes : one in which the lesions have an exudative or extreme inflammatory form, and the other in which they have the degenerative form. The degenerative form he associates with granular kidney, and he believes that it is dependent on vascular changes and more or less mechanical in origin. The impairment of sight caused by it is usually progressive, and its prognostic significance is the more grave because to the dangers to life from renal disease are added those of vascular degeneration. The exudative form is associated especially with parenchymatous nephritis. The retinal changes are inflammatory and probably toxic in origin, rather than dependent upon vascular degeneration. Sight lost by these changes may be in large measure recovered, and the dangers from vascular degeneration are not added to those of grave renal disease.

It would be very advantageous to be able to refine the diagnosis of this affection to the extent that West's paper suggests, and at either end of the series we may easily recognize the typical forms he describes, but the larger number of cases would have to be classed as of a mixed type—they occupy the middle ground. A more natural arrangement, it seems to me, is of one group, the two ends of which differ from each other in some such way as West indicates. I cannot agree as to the general freedom of the exudative cases from vascular changes, although in some of the exudative cases the vascular lesions may be of different kind and may be less permanent. It looks as though West had been led too far in an attempt to divide albuminuric retinitis, like renal disease, into one class in which dropsy is a marked symptom, and another in which it is slight or absent.

ALBUMINURIC RETINITIS AS A FACTOR IN THE CAUSATION OF GLAUCOMA is discussed by C. S. Bull,² the relation between the two conditions

¹ British Medical Journal, October 28, 1899.

² Transactions of American Ophthalmological Society, 1899.

being indicated by a series of four cases which he reports. Each of the patients had a history of grave renal disease, each was under treatment for albuminuric retinitis with retinal hemorrhages, and each was subsequently attacked with acute glaucoma. Bull thinks that the connecting link between the two afflictions is probably the disease of the walls of the bloodvessels, which may be regarded as the common cause of both the retinitis and the hemorrhages. (It may be noted that Bull speaks of the exudative form of retinitis in all these cases except one, which he did not see until after the outbreak of glaucoma had occurred and the media had become hazy.)

Bull quotes without approval or disapproval the therapeutic suggestion of Jocqs to do iridectomy as a precautionary measure in grave cases of retinal hemorrhages, cases which are most likely to be followed by glaucoma. It is doubtful if any patient suffering from albuminuric retinitis, and knowing its general prognosis, would choose a prophylactic iridectomy to escape his comparatively small chance of a secondary glaucoma, but so far as they go Bull's cases indicate that operation after the glaucomatous outbreak will check it. Three of his cases were operated on, one by iridectomy and two by anterior sclerotomy, and in each the pain and high tension were relieved and a marked restoration of vision ensued.

Retinitis of Various Forms. H. V. Würdemann and W. R. Murray¹ report a case of RETINITIS FROM A SHORT CIRCUIT ELECTRIC FLASH. There were the usual conjunctival congestion and pain. The eyes were blinded for a few minutes, then showed reduced acuity of vision, a small central relative scotoma, and contraction of the visual fields. The ophthalmoscopic symptoms were congestion of the retinal veins and haziness of the retina in the macular region. Recovery was complete in less than four weeks.

Two cases of DIABETIC RETINITIS are reported by H. O. Reik.² They both presented the numerous whitish dots belonging to the typical form of this disease. One case presented no other retinal lesion, and had nearly normal vision. The other patient had a round, white, atrophic patch in the macula of one eye, and a corresponding central scotoma. In this case the ocular symptoms led to the discovery of the diabetes.

Seven cases of POST-FEBRILE RETINAL LESIONS in soldiers recently returned from the West Indies are reported by W. K. Rogers.³ Two had suffered from yellow fever, and one of these presented an oedema of the central portion of the retina in the left eye, which gradually passed

¹ Ophthalmic Record, May, 1899.

² Annals of Ophthalmology, July, 1899.

³ Ophthalmic Record, October, 1899.

away but left the vision reduced to 5/cc. The other case presented retinal striae in the periphery of one retina, but vision was normal.

Two had typhoid fever, and one of these (one with normal vision) presented reddish-yellow rounded masses like sago grains (drusen?), encroaching on the macula and more numerous toward the temporal periphery. The other patient, who also had dysentery and was anaemic, had greatly reduced vision and an appearance of retinal oedema. The other three cases had contracted malarial fever and were anaemic. Two showed retinal hemorrhages, and one of these also showed a number of fine white points about the macula. In the other there was oedema of the retina. In the third case there was a dark granular area in the region of the macula in each eye, with a fine, net-like, yellowish exudation.

An anomalous case of retinal lesions, including a large pigment patch near the disk, narrowed arteries, pale disks, and lowered vision in a child of five years, is classed by H. F. Hansell¹ as a case of atypical retinitis pigmentosa.

Circinate Retinitis. To the cases of circinate retinitis now on record one has been added by W. E. Bruner² and another by G. E. de Schweinitz.³ In both of these cases the affection was binocular, and there was great impairment of vision. Neither of these cases throws any particular light on the causation of the affection, although both were carefully studied in all directions. Dreyer-Dufer⁴ reports a case in which a typical circinate patch of yellowish-white exudate was present in the left eye, while both eyes presented the generally diffused lesions of syphilitic chorio-retinitis, and the patient gave a clear history of primary and secondary lesions of syphilis. There were also small hemorrhages within the ring of exudate, and evidences of periarteritis.

Disease of the Retinal Arteries. EMBOLISM AND THROMBOSIS. F. Ostwalt⁵ reports the case of a man, aged sixty-eight years, with marked arterio-sclerosis, a trace of albumin in the urine, and no history of rheumatism, who by a violent muscular exertion produced an inguinal hernia and also the signs of rupture of an aortic valve. The next day he suffered an embolism of the central retinal artery of the right eye. Under treatment by vigorous massage the sensibility of the nasal portion of the retina was restored to the extent of counting fingers at three or four metres.

To Seigrist's cases⁶ of retinal embolism from tying the carotid, which

¹ American Journal of Ophthalmology, May, 1899.

² Annals of Ophthalmology, July, 1899.

³ Ophthalmic Record, January, 1900.

⁴ Annales d'Oculistique, February, 1899.

⁵ Recueil d'Ophthalmologie, February, 1899.

⁶ PROGRESSIVE MEDICINE, 1899, Vol. II.

I noted last year, H. Gifford¹ adds the case of a man who had both carotids and jugulars tied in the removal of an epithelioma of the left tonsil. Immediately after the operation the nurse noticed that the left pupil was much smaller than the right, but it was a week later when the patient found that his left eye was entirely blind. Ophthalmoscopic examination showed the usual appearances of obstructed retinal circulation, although Gifford thinks it probable that these were due to thrombosis rather than embolism. It was hard to distinguish between arteries and veins, both showing the interrupted blood current or necklace appearance. Later the vessels became uniformly narrowed. There was marked swelling of the optic disk, from which it is argued that the thrombosis extended into the small vessels supplying it. Light perception was lost from the first, and there was no recovery.

Embolism of a branch of the central retinal artery is reported by B. L. Millikin.² The branch affected passed to the temporal side just above the macula. Just within the disk margin the artery was obliterated, although beyond this spot it was only slightly smaller than on the disk side. The area of its distribution was pale, hazy, and swollen. The field of vision showed a corresponding complete scotoma below the fixation point, most extensive in the lower nasal direction, but the periphery of the field was normal. Vision was 6/LX. At the end of four days the obstruction in the artery had entirely disappeared. The paleness of the retina subsequently diminished, but the scotoma remained, and central vision, which for a time rose to 6/xviii, again fell to 6/xxx.

W. M. Cowgill³ reports a case in which an embolus lodged in the lower branch of the central retinal artery, causing blindness in the upper half of the visual field, extending to a horizontal line through the fixation point. Vision of 15/CC was retained, but was slightly eccentric. There was blanching of the lower half of the optic disk and narrowing of the lower branch of the retinal artery.

The FORMATION OF NEW VESSELS IN THE FUNDUS of the eye has frequently been observed in cases of recurring hemorrhage into the retina or the vitreous, but observations regarding such formation after retinal embolism or thrombosis are very rare, if indeed any other than those now to be mentioned have been recorded. Professor Königshöfer,⁴ of Stuttgart, reports a case which he observed in 1879, and which he has since vainly sought to parallel. A man, aged twenty-nine years, had an embolism of the middle one of three arterial branches passing downward from the disk, a part of the inferior temporal branch. This caused the

¹ Ophthalmic Record, December, 1899.

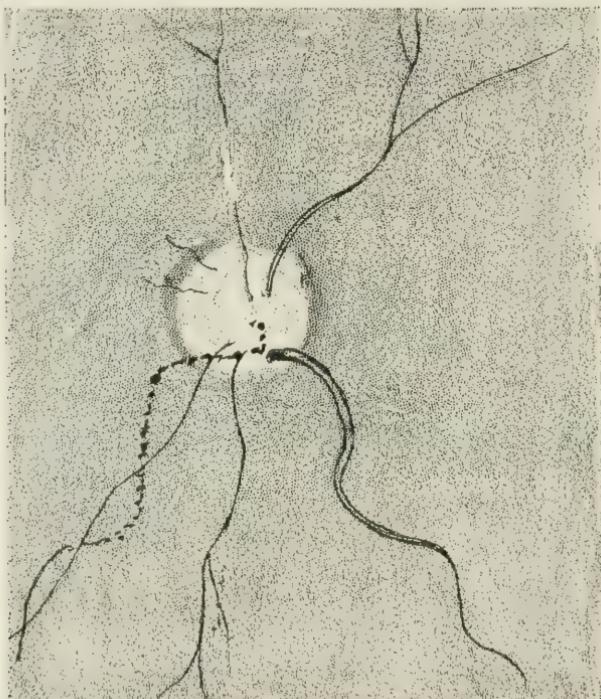
² American Journal of Ophthalmology, October, 1899.

³ Ophthalmic Record, March, 1899.

⁴ La Clinique Ophthalmologique, June 25, 1899.

usual retinal appearances in the affected part of the fundus, and a corresponding scotoma in the upper nasal part of the field, but within two months after the eye was first seen a branch from the inferior nasal artery extended over to the obstructed vessel, and the circulation in the affected retina was re-established. With this the scotoma rapidly diminished until it was only about 8° across and 25° from the fixation-point. Central vision was 5/iv.

FIG. 68.



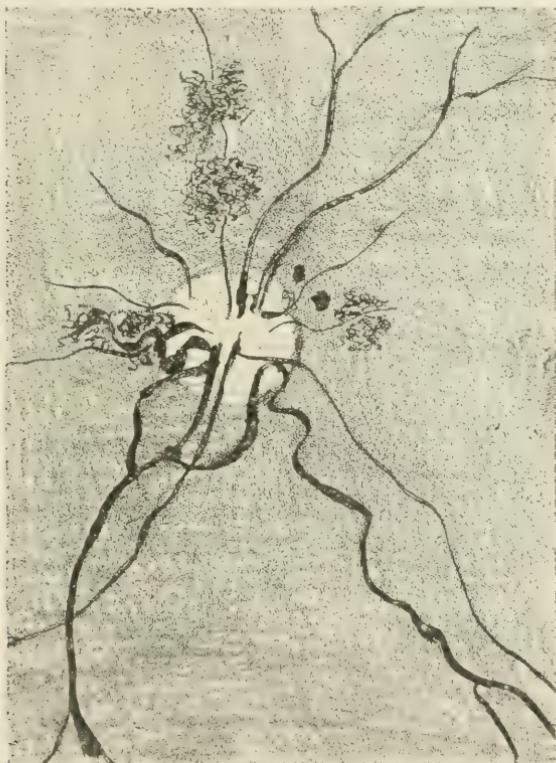
Obstructed retinal circulation of right eye. Appearance presented on the first day.
(BURNETT.)

S. M. Burnett¹ reports a case of this character, but he does not call it one of embolism, because he is "not sure the obstruction was due to an embolus." There was sudden blindness of the right eye and all the retinal vessels were reduced in calibre, but there was no oedema of the retina or cherry-red spot at the macula throughout the case. There remained of the visual field but a small sector outward and slightly downward. Next day there was some improvement in this field, and

¹ Ophthalmic Record, December, 1899.

the day after V. = 5 XVIII. The change in the vessels were noted as having begun on the second day, and included the re-establishment of some vessels, the complete obliteration of others, and the growth of new vessels, most of them minute and arranged in clusters of loops, but some of them large anastomosing trunks. The extent of these changes is indicated by the reproduction of Burnett's sketches in Fig. 68, made at

FIG. 69.



Obstructed retinal circulation, the same eye as Fig. 68. Appearance at the end of eight months. (BURNETT.)

the first examination, and in Fig. 69, made at the end of eight months. The vision remained about as above indicated.

An important DISCUSSION OF RETINAL VASCULAR DISEASE before the Ophthalmological Society of the United Kingdom, June 8, 1899,¹ was opened by a paper by C. E. Beevor and Marcus Gunn, reporting a case of obliteration of a branch of the retinal artery following frequent

¹ Ophthalmic Review, July, 1899.

attacks of temporary amblyopia. There was atrophy of the lower half of the disk and shrinking of the lower branches of the retinal artery.

J. B. Story had seen a man, aged thirty-five years, on the tenth day after the onset of sudden blindness in the left eye. The optic disk was hazy, the arteries were thread-like, and there was a slight cherry-colored spot at the macula, as is seen in typical cases of embolism. Vision was reduced to perception of light. Inhalation of amyl nitrite caused some redness of the fundus and pulsation of the retinal arteries and veins could be produced by pressure. Daily inhalations of amyl nitrite were ordered, with potassium iodide internally, to which corrosive sublimate was afterward added. On about the twenty-sixth day rapid improvement began, and four days later $V. = 5/xx$, which after three months had risen to $5.v$.

Story also saw a woman whose left eye had suddenly become blind a week before, but which could then count fingers at five metres. The pupil was inactive, the retinal arteries reduced to threads, the veins beaded, and there was some oedema of the retina. Trinitrin was prescribed. In twenty-five days vision had risen to $6/ix$. After two months it was 6 VIII , the arteries were small, and the disk slightly pale with blurred edges. Story regarded both cases as examples of partial occlusion of the retinal artery.

Priestley Smith cited the case of a man eating two meals with only a short interval, falling asleep with plethora, and awaking blind in both eyes, but recovering sight in one. Mr. Cant reported the case of a young girl seen at intervals for nine months, with attacks of blindness of the right eye once a week, lasting ten or fifteen minutes. The eye then became permanently blind, and there was a distinct cherry-red spot at the macula. Similar attacks of temporary amblyopia had since occurred in the left eye, followed by a large hemorrhage.

From a careful study of reported cases Max Reimar¹ concludes that we are only warranted in assuming complete obstruction of the vessel where there is a visible break in the blood current and that for many cases the supposition of a proliferating endarteritis offers a better explanation than either embolism or thrombosis. As endarteritis C. Zimmermann² reports a case occurring in a man suffering from arterio-sclerosis. The point of obstruction was visible on the upper temporal artery three disk diameters above the disk.

C. A. Wood, in reporting a series of cases,³ calls attention to the fact that there is a tendency for most cases to improve with or without treatment. The instances of complete interruption of the blood-current are exceedingly rare. Some portions of the retina survive, and, after the

¹ Archiv für Augenheilkunde, March, 1899.

² Archives of Ophthalmology, July, 1899.

³ Ophthalmic Record, June, 1899.

initial stage of oedema and strangulation, partly recover. Then there are the chances of absorption or disintegration, or of displacement of the plug toward the periphery, where the area cut off from its blood-supply will be comparatively unimportant.

Wood's cases were treated by iridectomy, inhalation of amyl nitrite, and massage. The only striking improvement occurred in a case in which the embolus seemed to pass from the central artery into one of its branches, without any treatment at all. In the other cases slight improvement occurred, but it could not be clearly attributed to the treatment. Still, these facts should be borne in mind, that some cases of this condition do improve; that in some the improvement is so closely associated with the treatment as to make a connection between the two reasonably certain; and that every patient wants the benefit of even the smallest chance within his reach.

Detachment of the Retina. The attempts to cure detachment of the retina go bravely on, and although the successes are not very striking and the chief methods of procedure bear a close resemblance to methods that have failed in other hands, the persistent hopeful study of this class of cases should bring some advance. R. Deutschmann¹ reports 101 cases, including sixteen reported in 1895, and claims twenty-six as having been cured, thirty-four as permanently improved, and seven as much improved temporarily. His plan of treatment is operative. For the majority of cases he transfixes the lower portion of the eyeball with a narrow double-edged knife. This is entered as far back as possible through the lower outer part of the sclera, and thrust across the eye until it penetrates the sclera, but not the conjunctiva, upon the opposite side. Then as the knife is withdrawn its point is made to sweep through a curve passing close to the centre of the globe. This operation is claimed to afford the subretinal space two openings each way through which the fluid may drain off, through the retina into the vitreous, and through the outer coats into the subconjunctival space.

For cases not benefited by the above operation he still resorts to the injection into the vitreous body of the vitreous of young rabbits stirred up with normal salt solution. This is injected through a kind of knife canula. He states that repeated injections cause improvement in cases that cannot otherwise be benefited.

G. A. Berry,² reviewing Deutschmann's published cases, says that in regard to some which have been classed as cured an impartial critic might be disposed to differ; that the cures have been brought about by repeated operations, transfixion having been done eleven times on one

¹ Beiträge zur Augenheilkunde, vol. xl., 1899.

² Ophthalmic Review, February, 1900.

case, and that the advantage claimed for the vitreous injections is not supported by the clinical evidence which Deutschmann adduces. Berry thinks that it is repeated surgical interference, divested of any superfluities, which will eventually come to be regarded as an important advance in the treatment of this condition.

In evacuating the subretinal fluid, L. de Weeker¹ holds that one attacks merely the effect of the disease and not the disease itself, and that all operations intended to accomplish this are erroneous. In treating these cases he observes two principles: not to injure by inappropriate intervention, and not to impose a hardship disproportionate to the therapeutic result. Since Rachlmann published his theory of retinal detachment being caused by osmotic currents set up by an excess of salts in the vitreous, de Weeker has used injections of salt solutions between the sclera and the capsule of Tenon. After trying various solutions he prefers as least painful a 3.5 per cent. solution of gelatin in physiological salt solution sterilized by heat. The injections are made twice a week, combined with the use of mercurials and sometimes with the compress bandage and rest in bed. De Weeker does not report individual cases nor statistics, but supports his method solely by theoretical argument and by individual preference.

In discussing de Weeker's paper,² Dor thought that cures of retinal detachment were often spontaneous recoveries. Darier said that cure of detachment following choroiditis was cure by mercurial treatment. Rogman, after failure of the usual methods, had obtained a partial cure by administration of thyroid extract. Monphous had the opportunity to compare modes of treatment in the case of a patient whose right eye, becoming blind from detachment, was repeatedly operated on, with the result of temporary improvement but ultimate complete blindness. After two years the patient suffered complete detachment in the left eye. This recovered under treatment by dorsal decubitus with the compress bandage for a month, leeching at the beginning, mercurial inunctions, repeated laxatives, potassium iodide, and the application of the actual cautery about once in six days.

The treatment pursued for this last eye fairly represents the therapeutic resources to which the majority of ophthalmologists would resort with the greatest hope of doing some good, but no one could base upon it a positively favorable prognosis, and to carry the treatment out in all its details is such a serious undertaking that very few patients will care to make the experiment until the second eye is affected, and the only alternative is complete and hopeless blindness.

¹ *La Clinique Ophthalmologique*, May 25, 1899.

² *Annales d'Oculistique*, May, 1899, p. 372.

In estimating the value of any line of treatment the spontaneous recoveries are the perplexing factors. Nor can we set any close limit to the time within which spontaneous recovery from detachment of the retina may occur. Kopff¹ reports a case that he saw fourteen months after the detachment occurred, in a man aged fifty-nine years. The lower half of the retina was detached and the folds unusually prominent. The detachment had been spontaneous, not traumatic, and the eye was myopic, 13 D. He treated it actively for six months without benefit. The patient was seen every month or two, and after more than three years from the time the detachment occurred there was noted a marked improvement in the position of the detached part of the retina, which soon regained its normal position and appearance; vision improved from counting fingers at twelve inches to counting them at thirty inches. Kopff cites a case reported by Dor of recovery after seven years, with restoration of vision and of the visual field.

Last year I cited two cases of retinal detachment supervening upon glaucoma, and mentioned the bearing of such cases upon the diagnosis of intraocular tumor. A. Druault² reports a case in which detachment of the retina occurred in a highly myopic eye, and was complicated by retinal hemorrhages. Surgical treatment, excision of a 2 mm. triangle of the sclera, produced improvement which was only temporary. Seven months later the eye was attacked with glaucoma. The attacks recurred, and within a year afterward the eye was enucleated. There was no new growth. The glaucoma was secondary to exclusion of the pupil and iris bombé.

Tuberculosis of the Retina. Probably the second case of this condition on record, and the first in which a purely ophthalmoscopic diagnosis was made, is reported by A. C. O'Sullivan and J. B. Story.³ An apparently healthy woman, aged twenty-one years, applied for relief from failure of vision in the right eye, which presented the appearance of intense papillitis, but with the swelling of a brilliant whiteness. There were also small white spots in the retina about the macula. Vision was reduced to counting fingers in the nasal field. A definite diagnosis was not made until two months later, when vision was reduced to perception of light, and then periorbital redness and discoloration of the iris were present. Tension remained normal. The eye was enucleated and at the posterior part of the retina, around the nerve entrance, a tumor one-third of an inch in diameter and one-fifth of an inch in depth, composed of typical tubercular tissue, was found. This was separated

¹ Recueil d'Ophtalmologie, May, 1899.

² Archives d'Ophtalmologie, November, 1899.

³ Transactions Royal Academy of Medicine in Ireland, 1899, vol. xvii.

from the choroid by a homogeneous coagulum which stained like the colloid material of the thyroid gland. The patient continued in good health eighteen months after the enucleation.

DISEASES OF THE OPTIC NERVE.

Optic Neuritis. The leading thought with reference to optic neuritis is always in regard to its connection with some other grave disease, as a symptom of which it may have its chief importance, or by the treatment of which it is most likely to be cured. C. A. Veasey¹ reports a case attending quiet thrombosis of the sigmoid sinus of otitic origin. The neuritis appeared on the third day of the cerebral symptoms, and was most intense on the side opposite the thrombosis. Although the operation of opening the mastoid and the sinus was done a few hours after the discovery of commencing neuritis, and was followed by rapid recovery, the swelling of the optic disks continued to increase for a week, and fresh hemorrhages and exudations continued to occur for three weeks. The neuritis gave place to a decided tendency to atrophy. The periphery of the visual fields was but little affected, but there were scotomata. In the right eye the scotoma was central, reducing vision to 4/c. In the left eye there was a small relative ring-scotoma surrounding the fixation-point, V = 6/7.5.

Attention is called to the value of an ophthalmoscopic examination in intracranial complications of ear disease by Gradenigo,² who points out that the presence of ophthalmoscopic changes indicates that the disease has invaded the cranial cavity, but the absence of ophthalmoscopic changes does not prove the converse. He found in the records of 635 cases, including seventy-four of his own, the condition of the ocular fundus definitely stated in 172 cases, of which but ninety exhibited alterations of the fundus. The frequency of papillitis varied with the intracranial lesions from 60 per cent. in cerebellar abscess and septic thrombosis to 41 per cent. in extradural abscess. In a case otherwise doubtful optic neuritis becomes an imperative indication for operation.

A case of unilateral optic neuritis arising from basilar meningitis, with neuralgic pain around the eye, tenderness on pressure, and swelling, is reported by C. Higgens.³

Three cases of one-sided optic neuritis following influenza are reported by E. Wingenoth.⁴ The patients were all women, of eighteen, twenty-two, and thirty years of age. The swelling at the disk amounted to 2

¹ Ophthalmic Record, June, 1899. ² Annali di Ottalmologia, vol. iii.-iv., 1899.

³ Lancet, April 22, 1899.

⁴ Klinische Monatsh. für Augenheilk., March, 1899.

to 4 dioptres. Under the usual treatment for optic neuritis the cases did not improve, but with the free use of mercury by inunction recovery took place with restoration of vision. Probably these cases might with equal propriety have been classed as cases of retrobulbar neuritis.

Retrobulbar Optic Neuritis. W. G. Sym¹ admits the convenience of Gunn's definition of these cases, "rapid failure of vision, usually in one eye only, often accompanied by pain and tenderness in the neighborhood, absence of early ophthalmoscopic changes, and a tendency to recovery, are the usual prominent features." But he thinks it does not include all the cases that properly belong in this group. The failure of vision is chiefly a central scotoma, especially affecting the perception of colors, and more marked in a bright light. The unilateral character is given to the disease by exclusion of the toxic amblyopias which Sym thinks might well be included. He has seen the disease affect the two sides successively. The pain on pressure or on moving the eye is probably dependent on involvement of the nerve sheath and not due directly to the neuritis. As to recovery of vision, he thinks that in a large proportion of cases in which it seems complete, careful testing might elicit a paracentral area with deficient vision or color-sense.

As causes of the unilateral cases Sym recognizes : extension of inflammation from adjoining structures, syphilis, rheumatism, gout, and malaria. He also would include bilateral cases occurring in spinal disease, primary progressive cases, stationary scotomatous atrophies, so-called hereditary optic atrophies, and the toxic amblyopias. While I recognize that it is important to appreciate the relations of the above groups of clinical conditions, they differ so much from each other and from the condition commonly known as retrobulbar neuritis, in etiology, clinical course, prognosis, and treatment, that it would seem to be a mistake to attempt to call them all by the same name.

E. Nettleship, in his lecture² based on 120 cases he has seen, speaks only of the cases in which but one nerve suffers, or if both are attacked there is an interval commonly of months, sometimes of years, between the two. In one case the interval was five years. An interval of days only is very infrequent. The failure of sight is rapid, the climax being reached in one to five days, but it is never really sudden. Recovery of good sight is possible, even in the worst cases, if improvement sets in soon. The field of vision is invaded in various degrees, but in all cases the central part is involved, and in slight cases it alone is usually affected. The pain, however bad, is always limited to the side of the affected optic nerve, and is not accompanied by vomiting.

¹ American Journal of the Medical Sciences, February, 1899.

² Royal London Ophthalmic Hospital Reports, vol. xv., part 1.

In the idiopathic cases some ophthalmoscopic changes are usually present almost from the first, though they are often very slight, but in some of the worst symptomatic cases no change can be seen in the disk for some weeks after loss of sight. The diagnosis must be made from congenital amblyopia of one eye (suddenly discovered) or from hysterical amblyopia. In distinguishing the former from the latter the pupillary reaction to light in the affected eye is important, being diminished out of apparent proportion to the blindness. Of eighty-eight idiopathic cases fifty-eight were in females, thirty in males. But three (girls) were slightly below the age of puberty, fifteen years; nine were under twenty; sixty were between twenty and forty, and only seventeen over forty. Of sixty-nine under forty years, twenty-one were males, forty-eight females; but of seventeen over forty, there were eight males and nine females. It is a disease of the sexually active period of life, to which women are twice as subject as men. Other causes are exposure to cold during worry or fatigue and preceding infectious disease, especially influenza. (See Optic Neuritis.) Gout is a doubtful cause, and syphilis is very rarely one, having been certainly present in but two cases, and probable in only three others. In twenty-seven cases there was a history of special instability or actual disease of the nervous system. In fifteen there had been an actual loss of power or sensation in one or more limbs. An attack of retrobulbar neuritis should, Nettleship thinks, cause some anxiety as to the onset of future disease of the spinal cord. As optic atrophy in early tabes often means delay in the motor phenomena, it may be found that disseminated sclerosis beginning as a single retrobulbar neuritis shows less than the usual tendency to become generalized. For the treatment, when seen early, he believes in the usefulness of counter-irritation and the administration of iodides and often of mercury.

G. E. de Schweinitz¹ reports two cases of retrobulbar neuritis preceded by facial palsy, both occurring in women, one aged thirty and the other twenty. In the first, two years after the facial palsy came a right retrobulbar neuritis, and two and a half months later the left nerve was affected. Under potassium iodide both eyes recovered completely. In the second case there had been three attacks of sclero-keratitis and two of facial palsy. The retrobulbar neuritis occurred two years after the last attack of facial palsy and terminated in partial atrophy with vision of 6 L.

E. Valude² reports a case occurring in an hysterical man who had caught cold. As there were no soreness about the eye and no ophthal-

¹ Journal of Mental and Nervous Disease, May, 1899.

² Annales d'Oculistique, April, 1899.

moseopic symptoms, his amblyopia was at first thought to be hysterical, but ten days later the signs of marked optic neuritis appeared. Vision was fully recovered. Another case Valude reports was probably due to a syphilitic lesion near the chiasm.

Optic Atrophy. The form of hereditary blindness commonly occurring in men between the ages of twenty and thirty, and inherited from maternal ancestors, is usually spoken of as hereditary optic atrophy. Because it usually begins with central scotoma, it is sometimes spoken of as a retrobulbar neuritis, and under that title Strzemiński¹ reports three cases. Strzemiński's cases are interesting because they include a mother and two sons, and two other sons were said to be similarly affected, while two daughters had good sight. The mother and one son were affected at the age of twenty-five, the other son when about ten years older. The mother's mother was said to have been similarly affected. One of the affected brothers was epileptic, another insane. The ophthalmoscopic appearances were those of optic atrophy.

I have seen unmistakable retinal lesions at the beginning of this form of disease, and it seems to me in every way probable that it begins with disease and destruction of the ganglion cells in the retina, especially in the region of the macula. In the light of the neuron theory of the visual apparatus this supposition seems to exactly fit the facts.

Optic atrophy following profuse hemorrhage is rare, but has been reported often enough to make it certain that the association is not accidental. A new case is reported by S. Theobald,² of a man, aged fifty-seven years, who suffered from repeated hemorrhages from the stomach, so that his life was despaired of. The day of the second hemorrhage his sight became greatly impaired, and he believed that for two weeks he was entirely blind. Then vision gradually improved, until he could walk about the streets. At the end of five months his sight again grew worse, and in a few weeks he could only count fingers at one foot. When seen at this time the field was greatly contracted; there was advanced atrophy of the optic nerves, with marked contraction of the retinal arteries. From a consideration of the reported cases collected by Pergens,³ Theobald finds that the great majority of them point strongly to an obstruction of the blood current in the central retinal artery as the cause of the trouble. In view of the tendency to the formation of thrombi in post-hemorrhagic anaemia, the thrombotic origin of the obstruction seems highly probable. This is especially the case because the lowered blood-pressure in the vessels is exaggerated in the eye by the intraocular tension.

¹ *Annales d'Oculistique*, February, 1899.

² *American Journal of Ophthalmology*, May, 1899.

³ *Annales d'Oculistique*, January, 1896.

W. A. Holden¹ has been studying the subject by examining the retinas in dogs and rabbits, after the production of extreme anaemia by bleeding. He found uniform degenerative changes in the ganglion cells of the retina and evidences of retinal oedema, but there were no marked changes in other portions of the visual tract. Similar evidences of degeneration were found in two cases of pernicious anaemia.

It seems unnecessary to assume that complete exclusion of blood from the retinal vessels is necessary to the production of the retinal changes and of the optic atrophy that succeeds excessive loss of blood. Indeed, the observed cases negative the idea of a complete shutting off of blood from the retinal vessels. It is perfectly conceivable that with lowered blood-pressure the intraocular tension may so far reduce the amount of blood entering through the central artery as to produce the degeneration found by Holden, and the later optic atrophies observed with the ophthalmoscope, without the need for the intervention of any thrombosis. While thrombosis might well be expected under the circumstances, it is not necessary to the explanation of these cases of amblyopia and optic atrophy.

Holden also makes some very suggestive remarks on the physiology of the neurons of the visual tract and on our present conceptions as to their pathology. The neurons of the retina send their long axis-cylinder prolongations through the optic nerve and tracts to the primary optic centres at the base of the brain. The neurons of those centres send their long axis-cylinder processes through the tracts and nerve to the retina. Now, atrophy of each of these axis-cylinders depends on its separation from the ganglion cell to which it belongs or upon disease of that cell. Separation may come by division, by pressure on the nerve, or by inflammation of the connective tissue supporting the fibres. When optic atrophy arises independently of the latter class of cases, there must be degeneration of the ganglion cells of the retina or of those of the basal ganglia. But each optic tract is connected with the corresponding half of each retina. Degeneration of the basal ganglia would, therefore, almost certainly involve amblyopia and atrophy affecting half of each eye, or homonymous hemianopsia. Hence any disease like tabetic or hereditary optic atrophy, showing a scotoma confined to one eye or more advanced in one eye than the other, and not limited by the line dividing the right and left halves of the retina, must affect the retinal set of neurons.

In the treatment of tabetic atrophy L. de Wecker² has given up all debilitating measures, such as vigorous antisyphilitic treatment. He

¹ Archives of Ophthalmology, March, 1899.

² Annales d'Oculistique, January, 1899.

thinks the cases supposed to have received benefit from such treatment have not been watched long enough. He believes, with Charcot, that "the first ataxie is yet to be cured." The treatment of gray optic atrophy with mercury and iodides he believes to be harmful.

On account of the results obtained in cases of glaucoma, J. M. Ball¹ tried resection of the sympathetic on an eye with vision reduced to light perception by optic atrophy of apparently aleoholic origin. One month later there had been no change in vision. G. F. Suker² was also induced to try resection of the cervical sympathetic for simple optic atrophy. The result at the end of one month was a noticeable improvement in light and form perception and enlargement of the field of vision. The apparent dependence of optic atrophy upon conditions of the circulation justifies a trial of this measure as one of possible value.

TOXIC AMBLYOPIAS.

Methyl Alcohol Amblyopia. Seven cases of this affection have been reported within the last year. The use of the drug is rapidly extending in the arts on account of its cheapness as compared with ethyl alcohol which it replaces, and for the same reason it is likely to be used more frequently as an intoxicant. In all probability, therefore, cases of blindness from its use will become more common, and since the prognosis is very grave in spite of a deceptive lull in the symptoms, a good understanding of the subject may be of great practical importance.

The case reported by Moulton³ was that of a man, aged thirty-three years, one of five men who had each drunk nearly half a pint of wood alcohol. Two died, two recovered entirely. The man who was the subject of the report became very weak, but was not unconscious at any time. The next day his sight began to grow dim, and in a few hours was lost entirely. After several days some sight returned. When Moulton saw him, five months afterward, he had light perception in the right eye and could count fingers at one foot with the left eye. The ophthalmoscope showed optic atrophy, with great reduction in the size of the retinal vessels, except two arteries that passed to the macular region of the left eye. The field of vision of the left eye was greatly contracted, and showed a central scotoma.

In the case reported by H. Kuhnt⁴ the amount of alcohol taken was not known. The impairment of vision began on the fourth day, with

¹ Trans. of Ninth International Ophthalmological Congress, 1899.

² New York Medical Journal, February 24, 1890.

³ Ophthalmic Record, July, 1899.

⁴ Zeitschrift f. Augenheilkunde, January, 1899.

severe headache and pain about the eyes. In Gifford's case¹ about one-sixth of a pint was taken diluted with twice its bulk of water. The next day the man's head felt sore and confused, and he took another swallow of the mixture. The third day he felt much the same, but he vomited all the following night, and a terrific headache began; the next morning everything looked foggy. On the fourth day he could not perceive light, and his pupils were widely dilated. In another case a man was found totally blind with widely dilated pupils twenty-four hours after drinking the spirit; he died two hours later.

In two cases reported by R. S. Patillo² the men were poisoned by inhaling the vapor while shellacking the inside of beer vats. The vats had but a small vent-hole, and the temperature was about 70° F. One, after working four days, had to discontinue on account of nausea, dizziness, and severe frontal headache. On the fifth day his sight was fogged, and on the sixth day he became totally blind. The other man, after working two weeks, had similar symptoms. The following day his sight was dim, and the next day he became totally blind. J. E. Colburn³ has also seen a case produced in a man who inhaled the fumes while using the alcohol quite freely in a closed room, to clean old furniture. After working five or six days the patient's vision began to fail, and a day or two later was greatly impaired.

In those cases which became totally blind there was a period of from five days (Kuhnt's case) to about three weeks (Gifford's) or twenty-four days (Patillo's) of such blindness, and then followed a gradual improvement. Kuhnt's case went on to complete recovery in about a month. Gifford's improved for about ten days, when he could count fingers at several feet and had normal outer limits of the field for white, but a large absolute central scotoma. Then vision remained stationary for a week, and after that declined until he was said to be entirely blind. One of Patillo's cases after blindness for a week recovered sight sufficient to enable him to walk around and to read the headlines in a newspaper. Then, after two weeks, sight failed again until the right eye could just count fingers at three feet, and the left had only light perception. This same temporary improvement in vision has been noted in the cases previously reported.

Early ophthalmoscopic observations on these cases are mostly lacking. Usually when first seen the optic disk has been rather pale, especially in its outer quadrant, and sometimes it has been a little hazy. Colburn and McCoy and Michael⁴ mention optic neuritis. At a later stage the optic disks are always very pale and the vessels generally contracted; Moulton speaks of them as mere threads.

¹ *Ophthalmic Record*, September, 1899.

² *Ibid.*

³ *Ibid.*, December, 1899.

⁴ *Medical Record*, May 28, 1898.

The mode of onset of these cases, the central scotoma, and the pain and soreness about the eyes are very suggestive of a bilateral retrobulbar neuritis, and so is the early beginning of improvement, but here the resemblance ceases, for, with the single exception of Kuhnt's case, they have not recovered but have gone on to blindness with optic atrophy.

W. A. Holden¹ has studied the effects of poisoning by methyl alcohol upon the retinas and visual tracts of dogs. He says that at the end of fifteen days "the nerve-fibre and ganglion-cell layers were slightly edematous, but no hemorrhages were found. Many of the ganglion cells were in a state of degeneration. In the optic nerves, stained by Marchi's method, the medullary sheaths of some of the fibres were broken down. The amblyopia due to the use of methyl alcohol, therefore, comes into the category of those amblyopias which are due to nutritive disturbances in the ganglion cells of the retina."

This conclusion is judged "decidedly hasty" by Gifford, who says: "The orbital pain noted in the case of my patient and that of Kuhnt, the positive neuritis observed by McCoy and Michael, and the complete blindness followed by marked but mostly temporary improvement, all indicate primary affection of the optic nerve, though it may well be that the ganglion cells also suffer primarily." While a double lesion is generally a poor explanation, in connection with poisoning it is admissible. It seems to me likely that we have both a retrobulbar neuritis and a primary degeneration from poisoning of the ganglion cells. The retrobulbar neuritis tends to recovery, although it may be so violent that recovery would often be incomplete. But the degenerative changes starting in the ganglion cells give the affection the grave prognosis of a so-called primary optic atrophy. In Kuhnt's case we must suppose that only the neuritis occurred.

The treatment adopted by Kuhnt included warm drinks, pilocarpine, and potassium iodide in moderate doses. Gifford adopted the same line of treatment, but it failed to restore sight or prevent its complete destruction. The use of such remedies as have proven of some use in other toxic amblyopias, optic neuritis, or optic atrophy is rational.

Amblyopia from Jamaica Ginger. In 1897, A. G. Thomson² reported the case of a sailor, aged thirty-two years, who drank an amount of essence of Jamaica ginger, estimated at a quart and a half, in two days. The following day he had headache, nausea, and vomiting, and the evening of the next day after that he noticed that everything looked hazy. The fifth day after commencing the spree he could still grope around, but by the sixth day blindness was complete and lasted for a

¹ Archives of Ophthalmology, March, 1899.

² Proceedings of the Philadelphia County Med. Soc., 1897, p. 172.

week. Then there was improvement for four weeks, then a stationary period, and after that vision failed again. When seen three and one-half months later vision was as follows : Right, counting fingers at 1 metre ; left, 1/c, eccentric. The fields were concentrically contracted with large, absolute central scotomas. The optic disks were exceedingly pale, the lower outer quadrants being completely atrophied and greenish-white in color.

The essence of Jamaica ginger is properly made by percolating the ground ginger-root with alcohol. On shipboard and in certain localities where the sale of alcoholic beverages is forbidden it is largely used as an intoxicant. Very inferior preparations containing capsicum and probably other adulterants are on the market, and are chiefly sold in such prohibition localities. The State of Maryland seems to be especially rich in places where this intoxicant is resorted to, and H. Woods, Jr., has been able to report¹ six cases, four of which had been seen by himself, that presented the chief characteristics of Thomson's case. One had been drinking the essence for five or six days, and awoke unable to do more than make out large objects. He then became totally blind for four days, grew better until he could read, when again his sight grew worse. Another, after a three weeks' spree, had nausea, vomiting, sharp pains in the head and sudden blindness, followed by improvement of vision until he could count fingers, eccentrically, at six inches. The third man drank the ginger on Saturday and Sunday, worked Monday, and was awakened that night by nausea, followed by vomiting, gastro-intestinal cramps, and severe headache. During a vomiting spell his "sight went quick as a flash," but returned in a few minutes. Tuesday morning he awoke totally blind, and remained so ten days. Then came periods of vision alternating with total blindness. At the end of four weeks vision was 3/c, and the fields greatly narrowed. The fields, however, continued to improve, and at twenty-one months he was doing millwork without much trouble, although central vision remained unchanged. Woods' fourth case had taken about six fluidounces of the ginger in three days, and forty-eight hours afterward was seized with giddiness and a cloud over his vision. Vision then improved and varied, but the next morning he was totally blind. When seen four days later light perception was doubtful, and a month afterward it was lost. In Case V. the blindness came on the third day after nearly a week's debauch, and for a week or ten days it was intermittent, being absolute at times while at other times he had useful vision ; later light perception was lost. In Case VI. some twenty or twenty-five fluidounces were consumed on Saturday and Sunday morning. The patient had nausea,

¹ *Ophthalmic Record*, February, 1899.

gastric pain, and headache on Monday, and awoke Tuesday morning with very dim sight, which was soon lost entirely. During the next three weeks he claimed that now and then he saw a little, and for a month after that he gave momentary evidences of sight on several occasions. Later light perception was lost.

The earliest ophthalmoscopic examination was on the fourth day of blindness. The appearances were absolutely negative. In one case seen on the eleventh day the "disks were choked, and vessels, particularly veins, congested." In one at the end of three weeks "a low-grade neuritis, with probably commencing atrophy," was noted. One coming at the end of four weeks showed "nerves possibly a little pallid, no alteration of retinal vessels." After several weeks or months the signs of optic atrophy were noted in all except the man who recovered sufficiently to work.

The striking points in these cases are the manner of onset, the variability of the blindness for a time, the slight changes shown by the ophthalmoscope in the early stages, the ultimate optic atrophy, and the contraction of the peripheral field of vision and central scotoma. The onset was in every case marked by symptoms more severe than usually follow a period of intoxication, including nausea, vomiting, gastro-intestinal cramps, and intense pain in the eyes. Dimness of sight was noticed, and then in a day or so, usually on awaking in the morning, complete blindness. One patient first had attention called to his eyes by their "paining if he touched or moved them." The points of resemblance to methyl alcohol amblyopia would justify a careful investigation to determine whether this drug is used in the cheap "essences" of Jamaica ginger, but the resemblance may be of only that general character known to exist between other toxic amblyopias of diverse origin.

As to TREATMENT little can be said. Woods' case that improved most and preserved useful sight was put upon rapidly ascending doses of potassium iodide. In other cases pilocarpine was used early and strychnine later without beneficial results. One man was positive the strychnine always damaged his sight, and that pilocarpine temporarily helped him.

Quinine Blindness. H. Moulton¹ saw a boy, aged three years, who, after taking ninety grains of quinine in five days, was discovered to be blind. In the next two days he was given twenty grains more. When seen two weeks later he seemed totally blind, but at the end of four months he had recovered useful sight. Moulton has also seen a negro girl said to have been blind from quinine at four years of age. A new set of experiments by de Bono² support, as he thinks, his view that qui-

¹ Ophthalmic Record, August, 1899.

² Archives di Ottalmologia, May and June, 1899.

nine blindness is due to intoxication of the neuro-epithelial elements of the retina, and that the retinal ischaemia only prepares the ground by diminishing their resistance to the action of the alkaloid.

G. E. de Schweinitz¹ sums up the order of events thus: "Paralysis of the neuro-epithelium of the retina, manifest two hours after the administration of the toxic dose; degeneration of the ganglion cells and nerve-fibres beginning on the third day, which gradually increases; and, finally, degeneration of the optic nerve-fibres beginning as early as the seventeenth day and going on to complete atrophy, not only of the optic nerves, but of the tracts."

Amblyopia from Inhalation of Noxious Vapors. L. D. Brose² reports upon two cases of loss of sight from the inhalation of noxious gases left in a well after an explosion of dynamite. The attempt was made to enter the well more than two hours after the explosion. The first man who entered was exposed some twenty-five minutes, became unconscious, remained so about eighteen hours, and on recovering consciousness was found to be blind. When seen on the tenth day he had the appearance of grave anemia, was very weak, and could not distinguish light from darkness, though the pupils reacted to light. The disks were clear but pale, the retinal arteries small, and the veins prominent and distended. No hemorrhages were found. Under inhalations of amyl nitrite, strychnine and tonics, his general condition improved, and with it the appearance of the optic nerves, but vision remained restricted to counting fingers held just in front of the eyes.

The man who went to the rescue of the above patient also became unconscious, remained so about ten hours, and on resuming consciousness was also found to be blind. He recovered sight in thirty-two hours, and when seen on the tenth day seemed entirely well. The toxic agent by which these men were overcome is uncertain. Carbon monoxide has been credited with causing blindness of this general character. The effects of the poisonous gases produced by the explosion of dynamite are worthy of experimental study.

Toxic Amblyopias and Color Scotoma. The case of a passenger engineer with central color scotoma from toxic amblyopia is reported by J. O. Stillson.³ He points out that the importance of detecting such a defect in a railroad employé can hardly be overestimated. To avoid the risk of overlooking color scotoma, C. H. Williams⁴ would employ tests with a special lantern furnished with disks containing colored glasses, different shades of smoked glass, and apertures of different sizes. He

¹ Ophthalmic Record, December, 1899. ² Archives of Ophthalmology, July, 1899.

³ Ophthalmic Record, October, 1899.

⁴ Trans. of American Ophthalmological Society, 1899.

urges re-examinations every three years, or yearly if the vision of one eye is less than 20'XL, and after recovery from any severe illness. F. Allport¹ advises examinations to be repeated once in three years, or every year for those who use tobacco or liquor excessively. He also says: "Fortunately for the detection of acquired color amblyopia, the same pathological condition interfering with the proper detection of colors also occasions proportionate form amblyopia. This fact draws attention to existing poor vision which usually causes the patient to seek ophthalmologic advice." It certainly must be a very imperfect system that stops the employé with acquired color-blindness only at the end of three years or at the end of one year. No system will guard against the dangers of such defects that does not enlist the co-operation of the employé, by making it not to his great disadvantage to report to his superiors the slightest impairment of vision. If this will not entail too great a sacrifice on his part he will gladly escape any risk to himself or others, but if reporting a defect in vision means discharge and loss of livelihood he may ignore it or conceal it as long as he can.

Night Blindness. Hippocrates advised the free use of beef liver mixed with honey for this affection. Although various trials in Western Europe have shown no benefit from it, Trantas,² at Constantinople, has revived the treatment and has obtained satisfactory results. His first case had jaundice, enlarged spleen and liver, diarrhea, and hemorrhages from the gums, with vision reduced to counting fingers at 3 to 5 metres by daylight, and at a few inches by lamplight, with great reduction of the fields. There was xerosis of the conjunctiva, and insensibility with some opacity of the cornea. Other treatment having failed to benefit, 200 grammes of mutton liver per day were administered as nourishment. The improvement was immediate. In one week the sensibility of the cornea was normal and the acuity of vision had risen to 1 IV, and in twenty-four days the patient left the hospital with full vision in each eye, cured of his night blindness and keratomalacia.

Trantas then tried the treatment on other cases of night blindness, one with cancer of the liver, another of three years' standing in a young man, and one in this patient's father who had been affected for three months, both being insufficiently nourished on account of poverty. These were quickly cured, and the cure had lasted nine months. In an epidemic occurring in an orphan asylum much more rapid cures were attained than in a previous epidemic by other methods. Especially, Trantas notes, that the xerosis of the conjunctiva in these cases disappeared in

¹ Journal of the American Medical Association, December 16, 1899.

² Recueil d'Ophtalmologie, July, 1899.

ten or fifteen days, while in the earlier epidemic it had lasted for some months after the cure of the night blindness.

This condition of conjunctival xerosis with night blindness is pretty clearly connected with faulty general nutrition. H. D. Bruns¹ (New Orleans) has always seen it in persons of negro blood. He reports a case in which there was xerosis of the cornea and bleeding from the gums. The patient had been living largely on salt meat and Irish potatoes.

THE CRYSTALLINE LENS.

Cataract. Cure without operation has been studied by A. Alt,² who finds that it may come by spontaneous arrest in the development of the cataract, temporary improvement of vision, disappearance of certain opacities, absorption through the injured capsule, and bursting of the capsule containing a softened lens. Therefore, we must not be hasty in making the patient aware of his trouble, or too definite as to the time an operation will be required. As to the patient, "he will keep on going to the quack and swearing that his medicine has done him good, even if you have afterward occasion to extract his ripe cataract." An additional case of spontaneous absorption of cataract is recorded by R. Hilbert.³ The patient obtained with + 17 D. lens, vision = 6/LX. The other eye was the seat of a Morgagnian cataract, which he naturally refused to have operated upon.

The CONNECTION OF CATARACT WITH TETANY is supported by two cases reported by Wettendorfer⁴ occurring in women, one at the age of twenty-eight, the other at thirty-nine. The latter had been subject to the attacks for five years, the former for three years. Both during the attacks experienced impaired distant vision, while near vision remained good prior to the development of the opacity. The continuous impairment of vision had lasted six and twelve months respectively. Wettendorfer made an elaborate microscopical study of the lenses removed, and supports the view that spasm of accommodation is a cause of lens opacity. The connection of convulsions with cataract occurring in childhood has long been noticed.

DIABETIC CATARACT. R. L. Randolph⁵ reports three cases on which he did five extraction operations, which were followed by normal healing except for a mild iritis in two of the eyes. Good vision was obtained in four of the eyes, and in one was only prevented by changes in the optic

¹ American Journal of Ophthalmology, March, 1899.

² Ibid., January, 1899.

³ La Clinique Ophtalmologique, May 10, 1899.

⁴ Beiträge zur Augenheilkunde, 1899, part 38.

⁵ Ophthalmic Record, April, 1899.

nerve. The operation was in each case done with iridectomy to obtain a large pupil for the removal of the swollen cortex. This experience is in strong contrast with that which made the older surgeons refuse to operate for diabetic cataract. Still the chances of a favorable result are not so good in these cases as in uncomplicated senile cataract.

CATARACT AND HETEROCHROMIA. The fact that in eyes differing greatly in the pigmentation of the iris the eye with the light iris is first affected with cataract was pointed out by J. Hutchinson and has been confirmed by others. A. Schrapinger¹ reports a case in which the color of the eyes, it was said, had originally been the same (brown) in both, and the blue-gray eye which presented a ripe cataract (the other lens being perfectly transparent) had changed its color in the last nine years. The affected eye exhibited no inflammation or other sign of disease. J. Malgat,² commenting on this, says that in the nine cases he has seen the heterochromia had existed from early childhood, and this exception should be very carefully established, although he admits true albinism may not always be congenital.

FIG. 70.

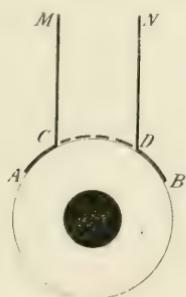
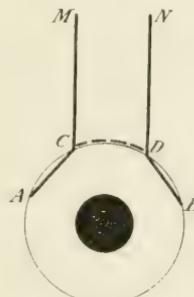


FIG. 71.



Incisions for subconjunctival extraction of cataract. (PANSIER.)

CATARACT OPERATIONS. *Extraction* with an adherent flap or bridge of conjunctiva is advocated by P. Pansier.³ He makes a sclero-corneal incision as shown in Fig. 70, including *A B* about one-third of the sclero-corneal margin. But instead of completing the section in this line, when there remains 5 or 6 mm. of tissue, *C D*, he turns the edge of the knife back under the conjunctiva, but upon the sciera, and makes it cut *C M* and *D N*. Then when the edge of the knife reaches *M N* it is withdrawn, leaving a bridge of conjunctiva attached to the cornea at *C D* and to the remainder of the conjunctiva at *M N*. If the eye be deeply sunken the form of the incision is more that shown in Fig. 71, somewhat longer from *A* to *B* and more in the cornea. With such an adherent

¹ New Yorker medicinische Monatschrift, April, 1899.

² Recueil d'Ophthalmologie, June, 1889.

³ Annales d'Oculistique, October, 1899.

conjunctival flap a large incision is not so much to be feared. The delivery of the lens beneath the conjunctiva is effected in the ordinary manner. The prompt healing secured by this method allows the operated eye to be left free in four or five days. If at any stage in the operation it appears desirable, the conjunctival bridge can be divided at any point. Whether this plan will prevent prolapse of the iris will have to be ascertained by a considerable series of extractions without iridectomy, which Pansier cannot furnish. He thinks it will not be superior in this respect to the corneal suture of Kalt, which permits prolapse in 5 per cent.

The chief disadvantages are: The incision is a little more difficult to make. There is always some hemorrhage to interfere with subsequent steps of the operation, and the blood may fill the anterior chamber so that the lids have to be closed and the aqueous allowed to collect and expel it. He has thus always been able to obtain a clear field of operation. The nucleus of the lens is expelled as easily in this method, but there may be more difficulty in clearing away the cortex. In sixty cases, however, he has only once been compelled to do a subsequent discussion to get a clear pupil.

This subconjunctival extraction of cataract is also practised and recommended by Vacher.¹ In forty operations of this kind he has seen no case of hernia of the iris. The conjunctival flap in a few hours contracts adhesions which will prevent it.

The post-operative astigmatism is less, or at least such is the case in a series of observations made with the ophthalmometer ten days after extraction.

That this operation will largely replace the "simple" and "combined" operations now generally practised seems to me improbable, but it does seem to be a far safer and better operation than extraction with the insertion of a corneal suture, and in cases that present special difficulty, on account of the tendency to movements of the lids and restlessness during healing, it may be of value. In the rare cases, too, in which one is compelled to operate with the conjunctival sac not thoroughly aseptic, this may be distinctly superior to any other operation now practised.

Extraction of the lens in the capsule has been practised by Gradenigo for three years. Saggini² describes the method and states that in 202 cases prolapse of the vitreous occurred but twenty-five times, and only four cases terminated "unhappily." The corneal incision is made upward with a modified Graefé knife. The upper part of the zonule is divided by an instrument (zonulotome) something like a cystitome which

¹ Annales d'Oculistique, November, 1899.

² Ibid.

is slipped beneath the upper part of the iris. Usually a large iridectomy is made. In the delivery of the lens the counter-pressure is made on the sclera by a ring surrounding the cornea.

The operation of extraction in the capsule has, in this country, too recently fallen into disuse to excite very much interest at present. There are a few cases in which lens and capsule are disposed to come out together without the use of a "zonulotome," and in these the detached capsule may well be removed with the lens in it, if the operator is quick enough to appreciate the situation in time.

Extraction by Suction. When the lens has been rendered opaque by dissection for high myopia Rogman¹ prefers to remove it by Teale's suction instrument. By this plan a clear pupil was obtained in four to fifteen days and by the two operations. Terson, Sr.,² thinks the suction method suited only to homogeneous soft cataracts. In traumatic cataract complicated by subluxation of the lens it achieves its most brilliant successes. It is indicated when the eye is inflamed and antiphlogistics fail to relieve, but it must be done with great care. Terson prefers to do it with a Bowman syringe.

EXPULSIVE HEMORRHAGE FOLLOWING CATARACT EXTRACTION. A case is reported by A. R. Baker³ in which both eyes were lost by this complication. The one first operated upon (by simple extraction) did well until the sixth day, and then was lost by hemorrhage and had to be enucleated for pain. One year later a preliminary iridectomy was done on the other eye, and all went well. Five weeks after that, extraction was practised, but within an hour the patient screamed with pain, and the whole contents of the globe were found extruded. Baker suggests that where one eye has been lost in this way the old operation of "couching" the lens should be tried for the other.

M. E. Valude⁴ reports a case in which he did this. Simple extraction was done on the first eye, and as he was about to apply the dressing, without a movement or a word on the part of the patient, without straining and without the least pain, there occurred a complete hernia of the iris. A compress bandage was applied, but in a quarter of an hour it was colored with blood, and on removing it the conjunctiva was found distended with blood clot. Two sutures were used to unite the corneal flap to the bulbar conjunctiva, and the form and volume of the globe were thus preserved. The patient desired the other eye operated on. Valude made a scleral opening a few millimetres back from the limbus, and introduced behind the iris a blunt rounded curette, with which the

¹ Annales d'Oculistique, January, 1899.

² Loc cit., March, 1899.

³ Trans. of Section on Ophthalmology American Medical Assoc., 1899.

⁴ Annales d'Oculistique, January, 1899.

crystalline lens was displaced downward and backward into the vitreous and held there several seconds. The lens did not tend to rise again. The pupil remained black. There was not the shadow of pain or redness about the eye, which was left uncovered after forty-eight hours. At eight days the vision with + 12 was 1/3. The ophthalmoscope showed the disk pale and cupped, with vessels tortuous. Valude thinks that the "chronic simple glaucoma without increased tension" explains the occurrence of the hemorrhage in the first eye. After six weeks the result in the second eye remained entirely satisfactory. The other eye was painful.

B. E. Fryer¹ reports a case, and concludes that the bleeding may follow any cataract extraction, but is most likely to do so in cases where glaucoma exists or has existed. In this case he had previously done an iridectomy for glaucoma.

Two cases of explosive intraocular hemorrhage are reported by J. S. Johnson.² One was after cataract extraction in a florid man with diseased bloodvessels, and the other followed iridectomy for glaucoma. Randolph's case following preliminary iridectomy has been referred to. Valude reported his case to the Société d'Ophthalmologie de Paris, and in the discussion of it four other cases were reported. Golovine³ publishes an extended study of the subject. In all this literature I find no mention of the simplest and probably the most important method of checking such hemorrhage, viz., raising the patient to the erect sitting position and dropping his feet over the side of the bed. The bandage, even the compress bandage, used more or less skilfully in the majority of cases, has been proved worthless for this purpose, and the fact that it cannot be depended on is one of the few things that may be regarded as settled as to this grave accident. The surgeon resorting to it in this connection is quite comparable to the ostrich sticking his head in the sand to shut out the unpleasant proximity of his pursuers.

RIPENING OPERATIONS. R. Jocqs⁴ proposes the following method: With a Pravaz syringe, having a fine point, the anterior chamber is punctured at its periphery, and several drops of the aqueous are drawn into the syringe. Then without withdrawing the syringe the lens is punctured obliquely with the point and the liquid expelled from the syringe into the lens substance. After about twenty-four hours the lens is opalescent, and in two or more days it is completely opaque. The aspiration is to be done gently, but the injection is done with some force. The liquid must all be thrown into the lens, and not allowed to escape.

¹ American Journal of Ophthalmology, February, 1899.

² Ibid., April, 1899.

³ Die Ophthalmologische Klinik, 1899, Nos. 1 and 2.

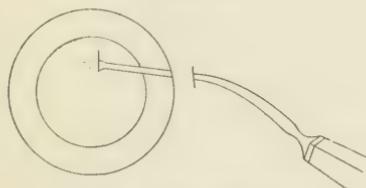
⁴ La Clinique Ophthalmologique, August 25, 1899.

again into the anterior chamber. Swelling of the lens is noted immediately. The extraction of the lens may be done on the third to the fifth day either by the linear operation or by suction. Joeqs had practised the operation on the eyes of rabbits and dogs, but not on the human eye. Its risks could hardly be known from his experiments, but it is a promising suggestion.

O. Scheffels¹ finds artificial ripening of immature cataract unnecessary in choroidal cataract (having a dark straw-color or brown, clear nucleus), in cortical cataract with a scale-like clouding of the posterior layers, and when cortical striae and opaque masses are embedded in clear lens substance. Iridectomy with massage of the lens he thinks is contraindicated by arterio-sclerosis and liquid vitreous.

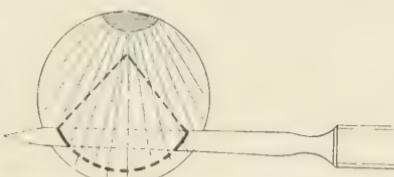
SECONDARY CATARACT OPERATIONS. Operations for secondary cataract show a larger proportion of eyes destroyed than do operations for primary cataract. At least such are the statistics of many operators, and fear of sacrificing what sight has been gained makes both operator

FIG. 72.



Division of pupillary membrane.
(KUHNT.)

FIG. 73.



Incisions for removal of irido-capsular membrane after occlusion of the pupil.
(KUHNT.)

and patient avoid any interference when otherwise it seems clearly indicated. J. M. Ray² reports two eyes lost and one damaged in fifty-three cases. One was lost by retinal detachment at the time of operation, the other by purulent hyalitis immediately following operation, and one was damaged by glaucoma. Ray advises against operation unless vision is below 1/iv.

This unsatisfactory status of the operation is a constant stimulus to changes in operative technique. H. Kuhnt³ for the division of membranes of moderate density, employs a knife-needle with a bent shank. As shown in Fig. 72, he enters this through the sclera. This, I think, is a very important point. These operations are dangerous chiefly through the risk of infection, and the bruising of a corneal wound by the necessary twisting of the knife to divide the flexible membrane makes

¹ Die Ophthalmologische Klinik, 1899, No. 3.

² American Journal of Ophthalmology, June, 1899.

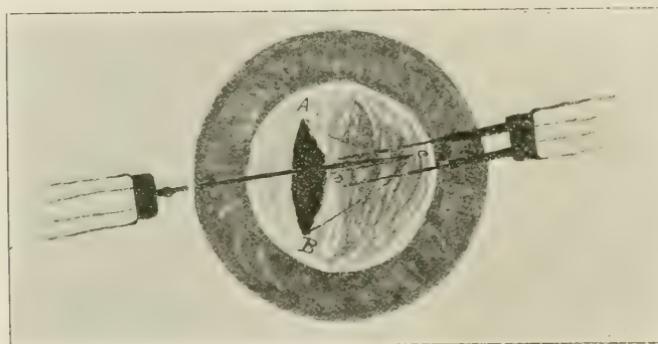
³ Zeitschrift f. Augenheilkunde, March, 1899.

it days before the eye is free from the risk of infection. But going in through a vascular tissue the slight bleeding caused practically closes the wound against infection in a few minutes.

Where the iris and capsule have been bound together in one cicatricial mass Kuhnt uses a narrow cataract knife as shown in Fig. 73, making puncture and counter-puncture through both membrane and cornea, and cutting a flap of each (see curved broken line). Then, seizing the irido-capsular flap with forceps, cuts are made at either end of the flap converging in the form of a V (see dotted lines). A large triangular piece of the obstructing membrane is thus removed.

A great difficulty in dividing the more delicate membranes is that they yield before the knife, and the opening made is found insufficient. This difficulty is largely overcome by entering the knife-needle at the

FIG. 74.



Fixing membrane with double-needle for discussion of secondary cataract. (BULLER.)

extreme periphery of the anterior chamber, as far as possible from the proposed incision, and thus giving it a longer sweep. To hold the membrane steady while it is being cut and so secure a sufficient opening and prevent injurious traction upon the ciliary body, F. Buller¹ proposes a very fine double needle, such as is shown on the right in Fig. 74, to be thrust through the membrane near its centre, and thus to fix it. The knife-needle shown on the left is then introduced and first used to make the vertical cut from *A* to *B*. It is then slightly withdrawn and made to pierce the membrane at *C* and cut toward *D*, between the joints of the double needle. The double needle is then withdrawn, and last the cutting needle. This completes the operation. In placing the double needle it should be made to pierce the denser part of the membrane. The injury inflicted by the double needle upon the cornea is compara-

¹ Trans. of American Ophthalmological Society, 1899.

tively slight, because no sweep is made with it, still it should not be inflicted in any case where a sufficient opening can be obtained by the single knife introduced through the vascular sclero-corneal margin.

DISEASE OF THE VITREOUS HUMOR.

Hemorrhage into the Vitreous. There is a recognized form of vitreous hemorrhage occurring in young men without traumatism or previously recognized disease. V. Miller¹ reports a case in a man, aged twenty-eight years, who as a boy had been subject to nose-bleed and had had much hemorrhage from the bowel during an attack of typhoid fever, but who gave no history indicating that he was a "bleeder." He had similar attacks fifteen and five years previously, but they had caused only moderate and temporary impairment of vision. He had influenza about three weeks before the occurrence of the last hemorrhage. This hemorrhage left a membranous mass in the vitreous that allowed only light perception.

A case with a more favorable termination is reported by L. A. Bize.² It occurred in a woman after excessive use of the eyes on the day preceding. The sensation produced she likened to "water flowing over the sight." Vision was reduced to light perception, and the vitreous was found cloudy and full of flocculent material. At the end of four weeks the fundus could be seen and the seat of hemorrhage located; four weeks later her vision was 20/xx.

A study of fifty-three cases of hemorrhage into the vitreous by Jaequau³ shows that such hemorrhages are most common between twenty and thirty years. Some occur before twenty and some after thirty, but none were noted between forty and fifty. After fifty they become more frequent again. Two-thirds of the patients are men. Before thirty both eyes are commonly affected, nineteen out of twenty-seven, but after fifty the affection is mostly monolateral, sixteen out of nineteen. Jaequau reports one case of his own, of a man, aged twenty-eight years, who had been subject to recurring attacks of hemorrhage into his right eye ever since he was twelve years old.

GLAUCOMA.

Association with Other Diseases. One way in which glaucoma passes unrecognized until the function of the eye has been partly or wholly destroyed is by its association with other diseases on which the

¹ Ophthalmic Review, February, 1899.

² Ophthalmic Record, November, 1899.

³ La Clinique Ophtalmologique, July 10, 1899.

attention of the physician is more directly fixed and to which some of its symptoms are easily referred. One of these diseases is facial ERY-SIPELAS. Commonly the glaucoma has first been noticed on the subsidence of the erysipelas. L. Demicher¹ reports a case in which a chronic glaucoma secondary to iritis had been relieved by iridectomy and instillations of eserine. A mild attack of erysipelas of the face caused a renewal of the glaucoma which, however, yielded again under the more frequent instillations of the same drug.

An intimate association of glaucoma with MALARIAL NEURALGIA was seen by L. A. Bize.² The patient gave a history of a similar attack five years before. The eye was congested and tender, the cornea steamy and slightly excoriated, the pupil dilated, the anterior chamber shallow, the tension increased; there was intense pain over the whole side of the head, entirely out of proportion to the increase of tension. Eserine and hot applications gave some relief, but the attacks recurred, the tension being hardly enough increased to justify iridectomy. In about a week the attacks began recurring at the same hour daily. Then quinine was given, and there was rapid improvement, so that ten days later the eye was practically well.

NEURITIS of the ophthalmic branch of the fifth nerve with glaucoma is reported by J. W. Dalbey and L. W. Dean.³ Eserine caused contraction of the pupil and reduced the tension to normal, but the neuralgic pain persisted. The cornea was involved. On account of the herpes iridectomy was not attempted, but subsequently the patient went elsewhere, had an iridectomy done, and lost the eye by panophthalmitis.

The occurrence of glaucoma secondary to albuminuric retinitis has been referred to in connection with that disease.

Glaucoma following cataract extraction is well known, but it almost always appears shortly after the operation, or shortly after an attempt to divide or remove a secondary cataract. S. D. Risley⁴ reports a case in which after simple extraction the healing had been normal, and division of the capsule at the end of six months gave vision = 6 v. This lasted until, three years after the original operation, the patient had a severe attack of influenza and the eye became red and painful. Transient attacks of dim vision followed, and after two months a subacute inflammatory glaucoma with T + 2. Iridectomy gave relief, and the eye recovered 6/IX vision.

Glaucoma in Early Life. The tradition that no eye is in danger of glaucoma until after forty years of age, and then all are in danger, is

¹ *La Clinique Ophtalmologique*, February 25, 1899.

² *New York Medical Journal*, September 16, 1899.

³ *Ophthalmic Record*, November, 1899.

⁴ *American Journal of Ophthalmology*, November, 1899.

kept up by many of the writers on the use of mydriatics. There have been many cases disproving it, but still more seem to be needed. A case occurring in a girl, aged sixteen years, is reported by S. C. Ayres.¹ The fields of vision were greatly contracted, but iridectomy checked the course of the disease, giving full vision in one eye. A case commencing at thirteen years of age, after the use of atropine in the eyes, is reported by A. Alt.² One eye was entirely blind with a very deep excavation of the optic nerve. The other eye had a very narrow field with eccentric vision of 20 c.

Glaucoma and the Accommodation. Last year I spoke of Hess' observation that exertion of the accommodation did not increase the intraocular tension. O. Lange³ reports a case in which it evidently lowered the tension. The patient, a man, aged fifty-seven years, had noticed for a long time colored rings around the light, and he had pulsation of the retinal arteries. He was given eserine for the recurring prodromic attacks, but came one day with the information that by reading a little very fine print he could also cut short the attack, and asked if he might not do this instead of using the drug. In one of these attacks with slightly dilated pupil, colored rings, arterial pulse, increased tension, and vision reduced to one-third, he was asked to read fine print, and in five minutes the pupil and tension of the two eyes were equal, vision normal, and all symptoms of glaucoma gone.

The Field of Vision in Glaucoma. G. E. de Schweinitz⁴ has made an analysis of observations made on sixty-three eyes affected with chronic glaucoma with special reference to the condition of the visual field. He finds that while it is true in typical cases of chronic glaucoma that the nasal half of the field is earliest and most severely affected, this is by no means a constant occurrence, for if an average field of a large number of measurements is constructed there will result a map which indicates general restriction rather than restriction in any one direction. Such a map based on averages of 184 charts is shown in Fig. 75. The color field, he finds, is often proportionately more contracted than the form field, so that it cannot be relied on for the differential diagnosis from simple optic atrophy. Scotomas are often found. They may be ring-shaped, crescentic, paracentral or disseminated. They may be studied by ordinary perimetric methods, carefully applied with suitable test objects and under varying degrees of illumination. These scotomata differ from those which occur in simple optic atrophy, and may be used as a differential test. They are often the forerunners of large defects in

¹ American Journal of Ophthalmology, April, 1899.

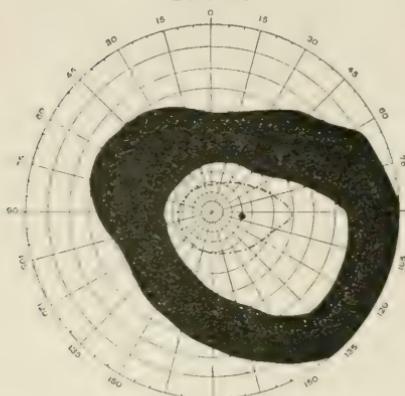
² Ibid., September, 1899.

³ La Clinique Ophtalmologique, January 25, 1899.

⁴ Annals of Ophthalmology, October, 1899.

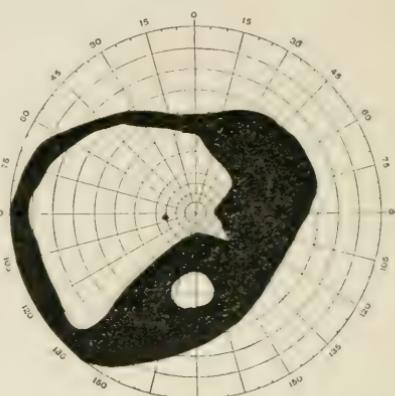
the visual field, the scotoma extending to the peripheral limit of the narrowed field. The field may assume almost any form, as the "acorn field," the "dumb-bell field," the "angled field," with large re-entering angles, and the "kite-shaped field." He also met with two marked instances of sentient islands in the dark areas, as illustrated in Fig. 76.

FIG. 75.



Visual field in chronic glaucoma, resulting from an average of 184 charts. (DE SCHWEINITZ.)

FIG. 76.



Chronic glaucoma. Visual field of left eye, loss of most of nasal and lower field, with sentient island in lower dark area. (DE SCHWEINITZ.)

Treatment of Glaucoma. Interest is still centred in the excision of the superior ganglion of the cervical sympathetic, or "resection of the sympathetic." T. Jonnesco, who introduced this operation as a method of treatment for glaucoma, continues to advocate it. He reports¹ eight cases, in five of which he removed the ganglion on both sides. The removal is effected through an incision along the anterior border of the sternomastoid, which is drawn back while the larynx is drawn in the opposite direction. When the vascular bundle is opened the internal jugular is drawn outward, the internal carotid and vagus inward, and the ganglion is found between them. It is isolated by the finger, and the nerve-fibres connecting with it are cut with blunt scissors, except the one entering it from above, which is torn loose by a strong pull on the ganglion. Jonnesco claims that his operations prove that this ganglion is important in the production of glaucoma, except the hemorrhagic form. The lowering of tension in the eyeball after the operation is undisputed, however it may be explained. The best results are obtained in cases in which inflammation and irritation are either slight or absent. The improvement may occur at once or later, but it is always progres-

¹ Centralblatt f. Chirurgie, February, 1899, and Wiener klinische Wochenschrift, May 4, 1899.

sive. This operation may be successful after iridectomy has failed to check the morbid process.

Three cases are reported by L. Demicheri,¹ in each of which one eye had been already lost by glaucoma. In two cases iridectomy had failed to check the course of the disease, and in one of these sclerotomy had also been tried with the same result. In each case the operation was followed by contraction of the pupil, ptosis, reduction of the ocular tension, improved central vision, and improved visual fields, and these results continued when the patients were last seen, from one to three months afterward. In each case the right was the better eye, in which the results were as follows :

Case I.—Central vision before operation 1/L ; after 2/III.

15	10	32	53	45	53
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Field before operation	22	R.	55	After	55	R.	68
------------------------	----	----	----	-------	----	----	----

30	56	57	52	70	70
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Case II.—Central vision before operation, fingers 1 metre ; after V = 2/III.

2	2	2	2	2	2
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Field before operation	3	R.	5	After	53	R.	5
------------------------	---	----	---	-------	----	----	---

52	52	18	70	62	35
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Case III.—Central vision before operation 0 ; after 1/xxx.

0	0	0	1	1	35
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Field before operation	0	R.	3 to 40	After	1	R.	65
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0	0	8 to 40	1	1	50
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In the above cases the figures indicate the number of degrees the fields extended in the horizontal, vertical, and oblique (45°) meridians. In the last case before operation central fixation was lost, the field beginning 3° outward and 8° out and down from the fixation-point. One month after operation central fixation had been restored. In the first case both sympathetics were resected ; in the second the left was resected, this being the side of the worse eye, which gained from hand movements to counting fingers, and in the third, the right ganglion was removed.

W. Zimmermann² reports a case in which vision was improved from 4/xx to 4/x. Before excising the ganglion a weak faradic current applied to it produced dilatation of the pupil. J. M. Ball, E. C. Renaud, and W. Bartlett³ report a case in which the tension of the right eye was +3, and vision reduced to light perception. The right sympathetic was resected, tension fell to +1, and pain was relieved. The removal was effected through an incision along the posterior border of the sternoc-

¹ *Annales d'Oculistique*, March, 1899.

² *Die Ophthalmologische Klinik*, 1899, No. 151.

³ *New York Medical Journal*, July 1, 1899.

cleidomastoid, and the external jugular vein and spinal accessory nerve were cut. About one inch of the ganglion was removed. J. M. Ball¹ reports another case in which both sides were resected, with an interval of twenty-two days between the operations. The better eye improved from light perception to counting fingers at seven feet. G. F. Suker² removed the right ganglion for great pain and stony hardness of the right eye. There ensued cessation of pain and reduction of tension, slight pupillary contraction, slight temporary dysphagia, and excessive lacrymation for several days. The left eye had suffered from glaucoma, which had been checked by iridectomy fifteen months before. Its vision was 20/200, and was not affected by removal of the right ganglion.

Last year I spoke of this operation as a justifiable experiment. Those who have since reported a trial of it all report favorably, and it has long been known that destruction of the sympathetic tended to lower permanently the tension in the normal eyeball. Perhaps it is right to speak of it now as a promising experiment, and that is as much as can be said of any therapeutic measure we have for simple chronic glaucoma. What is particularly to be desired is information as to the permanency of the relief afforded which can be furnished only by the lapse of time, and experience as to the measure of influence that the operation can exert in less desperate cases. It might well happen that what would sufficiently affect the nutrition of an eyeball fallen to the low plane of chronic glaucoma might not sufficiently affect the nutrition of an eye more nearly normal. Still what little evidence we have seems to indicate that the operation will be equally efficient at earlier stages of the disease, and it may possibly come to hold to simple glaucoma such a relation as iridectomy now holds to acute inflammatory glaucoma.

Hydrophtalmos. W. L. Pyle³ thinks this is the name which should be adopted to the exclusion of all the other terms such as buphthalmos, keratoglobus, hydrops oculi, etc., that have been applied to this congenital or juvenile form of glaucoma. He would distinguish between "true hydrophtalmos" depending on congenital defective development of the cornea, iris, or filtration angles, and hydrophtalmos secondary to fetal intraocular inflammation. He finds the prognosis for early operation more favorable than the text-books show. He advises treatment with iodides, mercurials, and myotics, and if after several weeks these fail, repeated paracentesis, a broad iridectomy, and repeated sclerotomies. The earlier the operation is done the better will be the result.

¹ *Revue Générale d'Ophtalmologie*, October, 1899.

² *Ophthalmic Record*, October, 1899.

³ *Annals of Ophthalmology*, July, 1899.

REFRACTION AND ACCOMMODATION.

Operative Treatment of High Myopia. The past year can show more papers written upon this subject than can any of its predecessors, yet there is not very much that is new.

THE AMOUNT OF MYOPIA CORRECTED BY REMOVAL OF THE CRYSTALLINE LENS depends upon whether it is myopia of curvature or axial myopia. Were the myopia due wholly to excessive curvature of the cornea, an eye having a myopia of about 12 D., as commonly estimated, would be rendered about emmetropic. If the myopia were due solely or chiefly to excessive curvature of the crystalline lens, removal of that lens would leave the eye hyperopic, whatever the amount of the preceding myopia. But myopia is usually due chiefly to lengthening of the antero-posterior axis of the eyeball. C. Weiland¹ points out that taking the dimensions adopted by Helmholtz for the schematic eye, a purely axial myopia of nearly 26 D. should be exactly corrected by removal of the crystalline lens.

As the number of reported cases increases we obtain clinical data with which to compare our theoretical conclusions. It thus appears that the average change produced in the refraction of the eye by removal of the lens for high myopia is 16 D. But this is not the amount of myopia in the eye that will be rendered emmetropic by the operation. Most of these eyes have been left hyperopic. The eyes rendered emmetropic by operation are commonly those which had 20 or 21 D. of myopia before the removal of the crystalline lens. This agrees pretty well with Hirshberg's rule that half the myopia before operation, subtracted from 10 D., will give the strength of the correcting glass required after removal of the crystalline lens.

WHEN TO OPERATE. C. S. Bull² says: If the central vision of the myopic patient with the best possible correction by glasses is not sufficient for the needs or social position of the patient, the operation is indicated first on the one eye and then on the other if no contraindications exist. If there are unmistakable evidences of a rapid increase in the amount of nearsightedness, true progressive myopia, and if the myopia is 12 D. or more the operation may be done. Le Vacher³ adheres to the rule to operate between the years of twelve and sixteen, when the dioptrés of myopia exceed the years of the patient's age. A. Bronner⁴ would remove the lens in some cases of myopia of 10 to 15 D., in many cases of 15 to 20 D., and in all of over 20 D. In children he would operate in all cases of over 14 or 15 D. This last I think is too sweeping.

¹ Annals of Ophthalmology, July, 1899.

² Annales d'Oculistique, June, 1899.

³ Medical News, January 20, 1900.

⁴ Lancet, November 18, 1899.

With myopia of 15 D. the child will not be rendered emmetropic, but will require after operation convex lenses for distant vision and stronger ones for near work, the latter of 6 or 10 D. Some cases of myopia with that amount or more will be rendered comfortable and will have the progress of their myopia checked by correcting lenses. The truth of the matter is, every case should be studied by itself, and an intelligent and sufficient trial of correcting lenses must be included in the preliminary study.

METHODS OF OPERATING. M. Pfluger¹ does dissection with a Bowman needle, taking special care not to penetrate the posterior capsule, and follows this with extraction, usually linear.

Rogman² follows dissection after four to fourteen days by the suction operation done with Teale's suction curette. He also attaches importance to not opening the hyaloid membrane. F. R. Cross³ has done extraction in patients over forty years of age, and in younger patients he commonly does a dissection and follows it by a linear extraction. Here would appear to be the special field for Joeq's method of rendering the lens opaque, but I have as yet seen no report of its trial on a myopic eye.

ULTIMATE RESULTS OF OPERATION. Rogman, in twenty-one cases, had one detachment of the retina which occurred nine months after the operation. He has had no infection and no glaucoma. He quotes Gelpke, who found nine detachments and seven cases of infection among 254 cases, and Fröhlich, who collected 572 cases, including thirteen of infection and nineteen of retinal detachment. Vacher had seen in twenty-seven cases two cases of detachment. Of his cases, sixteen were reported upon after periods of five years. Among these the retina had become detached in one, the vision had remained unchanged in one, and in all the others it had been permanently improved. In eleven of his cases the myopia had diminished from 0.5 to 3 D.; in two it had increased, and in seven it had remained unchanged since two months after the operation. He believes the operation has a real influence in checking choroidal changes and in preventing detachment of the retina. E. Fischer⁴ points out, however, that while Fröhlich found 3.3 per cent. detachments in eyes that had been operated on, he found only 1.25 per cent. among myopic eyes that had not been operated on. But all operative procedures are attended with risks, and for suitable cases of myopia, as H. V. Würdemann⁵ sums it up, "the dangers of operative interference are more than counterbalanced by the results to be achieved,

¹ Archives d'Ophtalmologie, June, 1899.

² Annales d'Oculistique, January, 1899.

³ Lancet, July 1, 1899.

⁴ Centralblatt f. praktische Augenheilk., March, 1899.

⁵ Annals of Ophthalmology, April, 1899.

which are, mainly, increase of visual acuity and of the visual field, and more extended use of the eyes."

EYE-STRAIN.

Toothache from eye-strain is reported by M. Neuschüler.¹ The pain was experienced on attempting to read, beginning in the orbit and extending gradually to the superior maxilla and teeth, and becoming so severe that the reading had to be given up. The pain is ascribed to insufficiency of the internal recti, but as prisms and correcting lenses were given at the same time, the cause of the strain is not wholly clear. The glasses gave relief.

Eye-strain from improper placing of lenses before the eyes, especially its relation to vertical centration, is discussed by B. L. Dunn.² It has long been recognized and written about in Philadelphia; but since our scientific international New York contemporary gives the subject the place of honor in its pages, it is probably worth noticing. Certainly in practice it is often overlooked to the disappointment of the patient and his adviser. No glass is the right glass unless it is rightly placed and the patient looks rightly through it.

Urticaria due to Eye-strain. A case is reported by C. A. Oliver³ in a patient who was presbyopic and had hyperopic astigmatism. The wearing of proper lenses relieved her entirely of the urticaria, from which she had suffered for years. Leaving off the glasses for a half hour would bring on an attack of hives, and when a mistake of 20° was made in the direction of her cylindrical correction the urticaria returned in a few days as bad as ever.

Eye-strain Causing Reflex Disturbances. G. M. Gould and H. Murphy⁴ call attention to the fact that the recognition of eye-strain reflexes is due almost wholly to the work of American ophthalmologists. Still they believe that in America to-day a million patients are "being treated for stomach, nutritional, nervous, and other reflex disturbances by drugs and what not when their diseases are due to eye-strain." The connection of eye-strain with general disease is worthy of careful attention on the part of those not especially interested in ophthalmology, for here is one of the outposts of medical knowledge, one of the points at which we have penetrated furthest into the mysteries of disease, and from which new views may be obtained that will guide correctly in other fields. There is far more in it than mere faddism, or send-me-your-patients-that-I-may-put-glasses-on-them.

¹ Recueil d'Ophthalmodiologie, August, 1899.

² Archives of Ophthalmology, September, 1899.

³ Philadelphia Medical Journal, January, 1899.

⁴ Annals of Ophthalmology, October, 1899.

F. W. Marlow,¹ among the causes of failure to relieve asthenopia and allied symptoms, finds congenital incapacity of the eyes for a normal amount of work, independently of their refraction and muscular condition and of the general health, organic disease of the eye or brain, and general disease. Again, the patient may neglect to wear his glasses constantly, or too much near work may be attempted by one, who, after suffering from asthenopia for years, has just had refractive and other errors corrected. In many cases the resumption of work should be quite gradual. Failure may result from neglect to correct low astigmatism, or, what amounts to the same thing, failing to correct astigmatism with sufficient accuracy. Faults of muscle balance may also be a cause. In a few cases he believes that only time will reveal the true defect so as to allow of its correction. He believes it an error to think that atropine and other mydriatics produce a complete paralysis of the ciliary muscle and thus reveal all the latent refractive error.

THE EXTRA-OCULAR MUSCLES.

Strabismus. The importance of nerve defects in the causation of strabismus is urged by M. de Micas.² He found among twenty-one cases that two had nystagmus, one double ptosis, one facial paralysis, one epilepsy, and three alcoholism, while nineteen had near relatives manifesting some form of neurosis. That strabismus may be established there must coexist an obstacle to binocular vision and a nerve defect. Strabismus is a sign of degeneracy. The direct heredity of squint is rare, but an ametrope born of neurotic parents should have special attention paid to the correction of the error of refraction and to the development of binocular vision. Operative treatment should be supplemented by treatment of the nerve defects, and the prognosis will depend on the character of such defects.

TREATMENT OF STRABISMUS IN YOUNG CHILDREN. The question of the time for operating on convergent strabismus has been earnestly discussed from the days of Graefé, who, in 1857, advocated early operation to bring the deviating eye into use and increase its visual power. P. Steffan,³ starting with faith in Graefé's teaching, has been led by his own experiences to reject it as unsound. He believes that the earlier the operation the more uncertain will be the final result and the more certainly will the surgeon be disagreeably surprised by the presence of a horrible overcorrection if he should meet with the patient again in after years. There is no reason to hasten the performance of an opera-

¹ Medical News, January 6, 1899.

² Annales d'Oculistique, February, 1899.

³ Archives of Ophthalmology, September, 1899.

tion, the only effect of which is cosmetic. The best results will be obtained after the intelligence of the patient has developed sufficiently to be of assistance in the treatment. "Whether binocular single vision, which has never been present or has been only slightly developed, can be permanently learned by means of stereoscopic exercise or not I do not know, but it certainly would require such persevering practice for a number of years that it is seldom if ever practicable. No operation should ever be performed before the refractive condition has been determined."

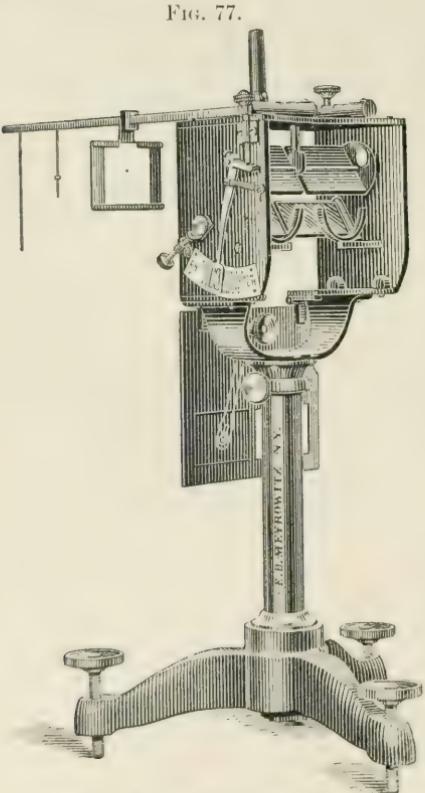
Such is a sample of the reasoning which has heretofore appealed most strongly to a large proportion of ophthalmic surgeons, and has seemed to justify the practice of refusing to operate before the age of six years, and often to defer operation until after puberty. I still think that if we knew no more about strabismus in general, and no more about the individual case before operating, than we have commonly known in the past, such a rule of practice would be the only rational and safe one, but there has been an increase in our knowledge of strabismus, and especially in our means of studying the individual case. Skiascopy has given us, what we did not before possess, the power of measuring the refraction of the eye, at even the earliest age, with sufficient exactness to secure all the benefits that are to be secured by the accurate correction of errors of refraction. Care and patience will supply all the essential data for which we usually have depended on the intelligence of the patient. We can now learn nearly as much about a strabismus, at two or three years, as formerly it was possible to learn at eight or fifteen years. This changes completely the question of the early treatment of strabismus, even of the operative treatment.

Priestley Smith, in a paper read before the Ninth International Ophthalmological Congress,¹ found among 576 cases of concomitant convergent strabismus that in 60 per cent. the age of onset was before four years, and in 39 per cent. it was between four and eleven years. In only 1 per cent. was it twelve years or over. He also found that false fixation, inability to fix with the macula of the squinting eye when the other was covered, occurred in 61 per cent. of the children who commenced to squint before two years of age; in 31 per cent. of those commencing between two and four; in 18 per cent. of those commencing between four and six, and in only one doubtful case commencing after six years—that is, after six years the power of true fixation is never lost except by loss of sight. In twenty-four cases seen within six months after squinting had become constant and monolateral, none had false fixation. This indicates that in squint the power of true fixation is at

first possessed, but that in cases commencing early it is lost by the continuance of the squint. Here is a most powerful argument for the early correction of the squint, before the power of fixation is lost.

Smith discusses the treatment of squint in children under four years of age. Three things may be done: (1) Diminish accommodative effort and sharpen the retinal images with glasses. (2) Exercise the squinting eye or each eye alternately by placing a pad or shade before the other. (3) Operate. Of fifty-five cases that were treated under four years of age, fifty-one wore glasses. Some took lenses as low as 1.5 D., but most of them were much higher. The youngest child was fourteen months old when he began to wear glasses. In thirty-eight cases the pad or shade was used. The best way generally was to place a pad of cotton under the glass, before the eye to be excluded from vision, and persistently to replace it when the child pulled it away. Treated thus, of eight cases of false fixation, five recovered true fixation. Five cases of monolateral squint became alternating. In other cases vision in the squinting eye was obviously strengthened, the first awkwardness disappeared and the pad was tolerated. In alternating squint the pad is superfluous, and where fixation power is irrevocably lost it is useless.

To aid and expedite the educative treatment, tenotomy was done in fifteen cases between two and four years of age, and in eight of these on both eyes. Smith had no reason to regret operating. Of seven brought at two years of age and operated upon, the eyes of five were straight, and two still had convergence. Persistent effort should be made to do without operation, but when the case comes to a stand-



Verhoeff's reflecting phorometer.

still and operation offers the only hope of binocular vision, Smith would operate. "In every case the child should be thoroughly examined soon after the strabismus begins."

Between operating for cosmetic effect without measurement of the re-

fraction, and operating to establish binocular vision at an age when it can almost certainly be established, after the careful trial of correcting lenses, there is a long step, and it is a step forward.

Heterophoria. For testing the balance of the ocular muscles and for their systematic exercise, F. H. Verhoeff¹ has proposed what he calls a "REFLECTING PHOROMETER," with which the patient sees the image of the test-object in mirrors; the change of direction of the image, or the disassociation of the images seen by the two eyes, is effected by change in the inclination of the mirrors, as in other phorometers it is effected by prisms (Fig. 77). Indexes connected with the mirrors show the amount of deviation of the visual axis accompanying such change in the mirror.

TWO INSTRUMENTS FOR MEASURING THE ROTATION OF THE EYE, the field of monocular fixation, are proposed by F. B. Eaton.² Both are rigidly attached to the head of the patient. One consists essentially of an adjustable perimeter arc. The other depends upon the reflections from two parallel mirrors. The latter may be used subjectively, the patient watching the reflection of a scale, or objectively, the surgeon watching the reflection of the patient's pupil.

R. H. Derby³ has improved the form of STEREOSCOPE mentioned last year. G. J. Bull⁴ has adapted the ordinary stereoscope invented by Oliver Wendell Holmes for use in testing for insufficiencies of the ocular muscles. E. Landolt⁵ has devised a new stereoscope for the re-establishment of binocular vision. It is essentially the fusion-tubes of Priestley Smith, with images printed on ground-glass, instead of the openings at the further ends of the tubes, with provision for dimming the image before the better eye until it makes an impression only as vivid as that made on the poorer eye.

In the domain of heterophoria it will thus appear that the principal achievements of the year are the invention of new instruments. Mention should also be made of FORCEPS of D. M. Greene,⁶ FOR FOLDING THE TENDON for "tendon-tucking," and of the TENDON MEASURE of Schweiger⁷ to indicate the length of tendon to resect in doing an advancement operation.

Paralysis of the Ocular Muscles. The association of these palsies with other conditions is always interesting. A. Rutter⁸ reports a case

¹ Johns Hopkins Hospital Bulletin, May, 1899.

² Ophthalmic Record, August, 1899.

³ Trans. of American Ophthalmological Society, 1899.

⁴ Ophthalmic Review, September, 1899.

⁵ Archives d'Ophtalmologie, December, 1899.

⁶ Ophthalmic Record, September, 1899.

⁷ Archives of Ophthalmology, July, 1899.

⁸ Lancet, February 4, 1899.

of oculomotor paralysis with ophthalmic herpes. G. E. de Schweinitz¹ reports a case of oculomotor palsy with typhoid fever. There was a relapse in the fifth week of the fever, and complete right oculomotor paralysis. At the end of six months there was still divergence with limited movements, but the pupil and accommodation were normal, and improvement still continued. Ophthalmoplegia externa with facial palsy, due to peripheral neuritis and ending in complete recovery, is reported by H. Sinigar.² Partial ophthalmoplegia, chiefly of the oculomotor alternating between the two eyes, is reported by Pearce Bailey³ as the first symptom in an atypical case of progressive muscular atrophy. L. Demicheri⁴ reports a case of recurring oculomotor palsy with headache (ophthalmoplegic migraine) which affected the eyes alternately.

DISEASES OF THE EYELIDS.

Ptosis. R. H. Shaw⁵ reports a case, probably coming on as recurrent oculomotor paralysis, in which the autopsy showed the cause to be an intracranial lipoma. Progressive paralysis of the elevator of the upper lid is very rare. P. Silex⁶ adds two to the five typical cases previously reported. In all cases the patients were women past middle life. Silex thinks that it is due to primary degeneration of the muscle, a myopathic form of progressive muscular atrophy. C. Worth⁷ reports a case in which there was deficient downward rotation of both eyes, and in which tenotomy of both superior recti muscles cured the ptosis. In this case the physiological connection between the upward rotation of the eyeball and the lifting of the lid was utilized. Attempts have been made to establish an anatomical connection between the superior rectus and the upper lid, but, as M. L. Foster⁸ points out in his careful review of ptosis operations, the test of time and experience must be applied before an authoritative judgment can be passed upon them. E. B. Heekel⁹ has secured the mechanical elevation of the lid by a piece of gold wire attached to the upper rim of a spectacle frame, and adjusted so as to permit closure of the eye and ordinary winking.

Blepharitis. BLEPHARITIS ACARICA is the name proposed by E. Raehlmann¹⁰ for a group of cases of marginal blepharitis in which he

¹ Journal of Mental and Nervous Disease, June, 1899.

² British Medical Journal, July 15, 1899.

³ Journal of Nervous and Mental Disease, January, 1899.

⁴ La Clinique Ophthalmologique, September 25, 1899.

⁵ Lancet, November 25, 1899.

⁶ Archives of Ophthalmology, July, 1899.

⁷ Lancet, November 18, 1899.

⁸ American Journal of the Medical Sciences, December, 1899.

⁹ Pennsylvania Medical Journal, September, 1899.

¹⁰ Klinische Monatsblatt f. Augenheilkunde, February, 1899.

found the living demodex folliculorum upon or about the diseased lashes. The specific treatment he used in thirty cases and recommends is :

Balsam of Peru	1 part
Lanolin	3 parts

to be rubbed into the lid margins. Under this treatment the lids improved greatly in two or three days, but, as is pointed out by W. G. Laws,¹ this rapid improvement rather disproves the causative relation of the demodex, since the living parasites were found after eight or more days. D. E. Sulzer² also, commenting on this supposed discovery, expresses doubt about it, since he has found the demodex in the normal lids of one person out of six examined.

DISEASE OF THE LACHRYMAL PASSAGES.

Lachrymal Obstruction in Children. From anatomical studies made on stillborn children, Rochon-Duvigneaud³ learns that at birth the nasal orifice of the lachrymal duct is often imperforate, and sometimes the passages are distended with mucus. After birth such an obstructed passage easily becomes infected, setting up the congenital form of daeryo-cystitis. Joeqs⁴ thinks that in these cases the indication is to hasten the development of the duct and secure its patency by rather forcible injections of fluid into the passages, the use of the probe having been unnecessary in his cases. E. Valude⁵ passes a small Bowman probe, a single probing often curing the case. Donald Gunn⁶ reports nineteen cases of lachrymal obstruction in the young. He divides them into the following groups : 1. Cases with fluid present at birth, contained in a cavity which probably represents the dilated nasal duct. 2. Cases noticed shortly after birth without dilatation of the duct. 3. Cases occurring later in syphilitic children, often with interstitial keratitis. 4. Cases of obstruction caused by tubercular disease of the bones of the nose or orbit. The cases in the first group were usually promptly cured by an operation. Those of the second group being less urgent were treated by pressing out the contents of the sac and using collyria. Some were cured, but many drifted away from under observation.

C. W. Hawley,⁷ from an experience with six congenital cases, concludes that the indications are best met in the following way : Open

¹ Ophthalmic Review, March, 1899.

² Annales d'Oculistique, January, 1899.

³ Archives d'Ophthalmologie, February, 1899.

⁴ La Clinique Ophthalmologique, May 10, 1899.

⁵ Annales d'Oculistique, May, 1899.

⁶ Ophthalmic Review, February, 1900.

⁷ Journal of the American Medical Association, February 17, 1900.

the presenting tumor by a very small incision, which can be readily covered so as to produce pressure and force the fluid into the proper channel, and if normal drainage is not soon established give an anaesthetic and probe.

Dacryocystitis. TREATMENT. Next to purulent conjunctivitis this is the condition that has seemed most benefited by protargol. In order to secure the prolonged contact of the drug with the mucous membrane, necessary to produce its full beneficial effect, A. Antonelli¹ has used gelatin bougies containing 50 per cent. of protargol. They are made the size of a 3 to 4 Bowman probe, and 3 or 4 centimetres long. Such a bougie requires five or six hours to dissolve ; it produces very rapid healing of the inflamed passages, with prompt cessation of purulent secretion. Although not pleased with its action in conjunctivitis, Clavelier² finds argentamin better tolerated than silver nitrate in dacryocystitis.

EXTIRPATION OF THE LACHRYMAL SAC has been advised by C. R. Holmes,³ J. B. Lawford,⁴ and M. Aronis⁵ when conservative treatment has been carefully tried and has failed to give relief, or when the patient cannot endure the treatment or give the time it requires. To these indications Holmes and Aronis add, when an operation must be immediately done upon the eyeball. Lawford adds, when there is impassable stricture or congenital absence of the duct, and Aronis follows Kuhnt in adding, serpent ulcer of the cornea, contraction of the sac with trachoma, or caries of the lachrymal or frontal bones.

WOUNDS OF THE EYEBALL.

Foreign Bodies in the Cornea. S. Snell⁶ found that among 48,262 accidents among miners, producing at least temporary disability for work, 2506, a little over 5 per cent., were accidents to the eye. Of fifty-seven benefits paid, those permanently incapacitated for following their employment, seven were on account of eye accidents. On the other hand, of patients admitted to the eye wards (Sheffield Royal Infirmary) among 2038 men 622 were for accidents, and of 516 women thirty-six were for accidents. Of 359 consecutive accident cases, 173 were due to fragments of iron or steel. In all large works are men who have a reputation for skill as "mote removers." One of these had not passed a day in fifteen years without being called on to perform this service, and sometimes he had removed a score or more in a day. Snell suggests that these men

¹ *Annales d'Oculistique*, April, 1899.

² *Loc cit.*, February, 1899.

³ *Archives of Ophthalmology*, January, 1899.

⁴ *St. Thomas' Hospital Reports*, vol. xxvi.

⁵ *Annales d'Oculistique*, March, 1899.

⁶ *British Medical Journal*, August 12, 1899.

should be furnished with iridium-platinum blunt-pointed spuds, and a spirit lamp and printed instructions for sterilizing the spud each time before it is used. He also suggests that grinders will find large glasses, either plane or correcting lenses, to afford great protection, and believes that the use of protectors should be compulsory for workers exposed to injury from iron or steel splinters or molten metal. The "pneumatic chipper" should be used wherever practicable; the men should be properly arranged at their work, and screens should be employed to save fellow-workmen and passers-by. The matter of disinfecting the instrument of the lay operator is important.

M. Black¹ has seen two cases of gonorrhœal ophthalmia from attempts of friends to remove foreign bodies from the cornea with the handkerchief, the friend suffering at the time with gonorrhœa.

Injuries of the cornea by chestnut burrs are not very rare, according to M. Gayet.² The points of the prickers may perforate the cornea, and remain to irritate the iris or cause traumatic cataract. Sometimes they are best removed by making a large corneal flap and extracting them from the inner surface of the cornea with specially adapted forceps. M. Deschamps³ observes some of these cases each year. The points of the prickers are sharp, stiff, and finer than the finest needle. He has found as many as twelve sticking into one cornea. They should always be searched for with a binocular loup or magnifier. This will often reveal, by oblique illumination, several spines where only one had been suspected. They cause severe pain, lachrymation, and blepharospasm, and grave corneal infection may ensue. In one case a single spine was tolerated for three months. In another case the cornea was markedly infiltrated at the end of twelve hours, and use of the galvano-cautery did not save it. The spines, which are always broken off at the level of the cornea, may be extracted with a Bowman needle or with epilation forceps which close very accurately and can be made to grasp the corneal tissue on either side of the spine.

Penetrating Wounds of the Eyeball. The great difficulty in treating these injuries and their great danger depend on the possibility of infection. I have urged⁴ that the removal of a foreign body which leaves an infected tract may be a brilliant operation, but it is a useless one. Fortunately, the bleeding provoked by operative interference in these cases helps to disinfect the wound, and thus saves a certain number of eyes that would otherwise be lost. Van Millingen⁵ reports the use

¹ Trans. of Colorado State Medical Society, 1899.

² Annales d'Oculistique, February, 1899.

³ Ibid., July, 1899.

⁴ New York Medical Journal, September 23, 1899.

⁵ Centralblatt f. praktische Augenheilkunde, June, 1899.

of the galvano-cautery to disinfect wounds that were doing badly at five days to three weeks after their infliction. He used a flat tip 2 or 3 mm. broad which he applied thoroughly to the wound in the coats of the eye, and thrust about 4 to 8 mm. into the vitreous cavity, keeping it there at full heat three or four seconds. This seems like a bold procedure, but it is justified by our knowledge of the dangers of infection in such cases, and more than justified by the results obtained. All the cases did well, two getting good vision, which was prevented in the third by traumatic cataract due to the original injury.

Magnet Extraction. Large portable electro-magnets for use with the 110-volt, direct-current lighting circuit have been devised by W. B. Johnson¹ and A. B. Kibbe.² They weigh several pounds, and hence cannot be handled like the Hirschberg magnet, but they are easily suspended so as to be very conveniently applied. In strength they stand between the ordinary portable magnet, which they should largely replace, and the giant magnet of Haab.

The giant magnet is being more widely used. Knapp reports an experience of thirteen cases in which it was used. In three cases the magnet failed to extract the piece of steel or give any indication of its presence, although it was found after the enucleation. In one case iron in the eye was suspected, but the magnet gave a negative result, and the eye recovered under expectant treatment. In seven cases the iron was extracted by the magnet. In one case there was perfect and permanent recovery, in another the eye was "doing well;" one eye was enucleated, and in the other cases the eyeball was saved without useful sight. H. Stillson³ finds that while the field of the giant magnet, as indicated by a small magnetic needle, is about 10 metres, the actual working distance is usually contact of the eye with the magnet. Multiplying the distance by three divides the force by seven, and dividing the weight of the object by two divides the attraction by four if the object be steel, and six if it be iron. An attempt to determine in which cases the giant magnet should be used, and in which cases the portable magnet is preferable, is made by Max Linde.⁴ He believes the latter is to be preferred in the majority of cases, although its power is sometimes insufficient. The giant magnet is capable of doing injury which has sometimes been more serious than the original traumatism. Knapp says that the "prejudicial consequences" of drawing iron splinters into the ciliary body were recognized by Haab, and exemplified in his own series of cases.

¹ Ophthalmic Record, November, 1899.

² Archives of Ophthalmology, March, 1899.

³ Ophthalmic Record, March, 1899.

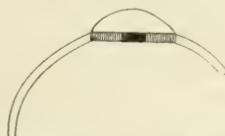
⁴ Centralblatt f. praktische Augenheilkunde, January, 1899.

ENUCLEATION AND SUBSTITUTES FOR IT.

Substitutes for Enucleation. These are still largely tried, one writer going so far as to head his paper "Simple Enucleation Not a Proper Surgical Procedure."¹ On the other hand, M. M. McHardy² never eviscerates, and thinks that no ophthalmologist would allow a substitute for enucleation in his own person. The proportion of ophthalmologists who feel this way about the matter is larger than appears from the literature.

M. E. Valude,³ experimenting on the rabbit, found that charcoal, the head of the femur of a young dog, and silk thread wound round with catgut were all unsuited to implantation within the orbit, and that with sponge, the best material for that purpose, the results were very uncertain.

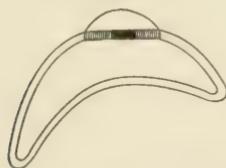
FIG. 78.



Section of artificial eye. Shell for insertion over retained eyeball, or after a Mules operation.

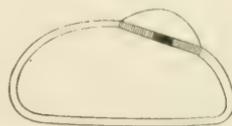
The motive of this search for a substitute for enucleation has been the hope to secure a better mechanical result, but cannot this be obtained without sacrificing the proven safety, the simplicity, and the rapid recovery of enucleation? Two important movements in this direction have been made. H. Snellen⁴ has suggested that the artificial eyes in common use (Fig. 78) have a shape fitting them to be worn over a

FIG. 79.



Artificial eye for insertion over shrunken globe. (SNELLEN.)

FIG. 80.



Section of artificial eye for filling out the empty socket. (SNELLEN.)

shrunken eyeball, and were not designed to fit the orbit after enucleation. He proposes that for this latter purpose artificial eyes specially adapted to it should be employed. He had made two general forms (shown in Figs. 79 and 80), the former to wear over a small stump, such as is

¹ Annals of Ophthalmology, January, 1899.

² British Medical Journal, September 23, 1899.

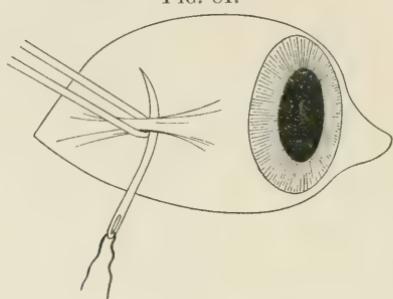
³ Annales d'Oculistique, July, 1899.

⁴ Ophthalmic Review, December, 1898; Klin. Monatsbl. f. Augenheilk., March, 1899.

obtained by simple evisceration, and the latter to wear after simple enucleation. These are contrasted with Fig. 78, representing the ordinary form suited to wearing over a shrunken eyeball or after a Mules operation, or implantation of a glass or other ball in the orbit. Snellen also suggested, if the proper form of artificial eye were not obtainable, the filling up of the ordinary shell with a preparation used by dentists, called Gilbert's temporary stopping. Several reports have been made, all favorable to the new form of artificial eye, but experience and study will be required to develop the full possibilities of Snellen's suggestion. It certainly should be possible by it largely to avoid the sunken appearance of the ordinary prothesis.

To improve the mobility of the artificial eye after enucleation, modifications of the operation have been proposed. Schmidt¹ proposed suturing the recti tendons together. Priestley Smith² has sutured them

FIG. 81.



Stitching tendon to the conjunctiva before enucleation. (PRIESTLEY SMITH.)

separately, each to the conjunctiva overlying it. This is done by rotating the eye strongly in the opposite direction, seizing the overlying conjunctiva and tendon with forceps, and passing a suture through them, as shown in Fig. 81. The best position for these sutures is 10 or 12 mm. from the corneal margin. To secure greater mobility of the prothesis with the stump after enucleation, H. Wolff³ proposes attaching it to the ball implanted in Tenon's capsule, but this would probably always lead to the extrusion of the whole mass. L. de Weeker and J. Masselon⁴ propose as a substitute for cosmetic enucleation the tattooing of the stump, in imitation of the normal eye. Possibly there may be cases in which this would be practicable, but it is impossible to get satisfactory results when the front of the stump is decidedly vascular and the operation would sometimes endanger the other eye by sympathetic ophthalmia. (See Diseases of the Cornea.)

¹ Klinische Monatsblatt f. Augenheilk., November, 1897.

² Ophthalmic Review, May, 1899.

³ Archives of Ophthalmology, July, 1899.

⁴ Annales d'Oculistique, December, 1899.

THERAPEUTICS.

Massage. Piesbergen¹ has applied vibration massage to the eye by an instrument used by photographers to retouch negatives. It acts on the principle of the Edison electric pen, and gives about two hundred strokes per minute. He finds it promises to be of value in chronic inflammatory processes and their sequelæ. In acute cases it may cause great irritation. Commonly, sittings of three to five minutes were repeated once or twice a week. It reduced the tension in glaucoma, and seemed to deepen the anterior chamber. Domee² has used intermittent pressure with the ball of the thumb through the upper lid upon the cornea. This is done very lightly at first, and never with such force as to be unpleasant. It is continued about five minutes at a sitting. He claims thus to have reduced hyperopia, and in glaucoma to have quickly relieved pain, diminished tension, and lessened the dilatation of the pupil.

Hot and Cold Compresses. E. Hertel³ has studied the influence of cold and warm compresses upon the temperature of the conjunctival sac and the orbit by experiments upon the rabbit. This influence he finds to be exerted by direct conduction. Under warm compresses the temperature rose 1.5° to 3° F. in about ten minutes, and continued about stationary so long as the compress was continued. Ice compresses reduced the temperature 4° to 8° F. in ten or fifteen minutes, then it became stationary. After discontinuing the compress the temperature returned to normal in about seven minutes.

The Use of Egg Membrane as a Protective. To prevent union of raw surfaces after a symblepharon operation, and after a burn of the conjunctiva, to support a corneal ulcer that threatened to perforate, and to prevent infection after iridectomy, D. H. Coover⁴ has used egg membrane. It is easily obtained and applied, produces no pain or irritation, is aseptic (provided the egg is fresh), is not acted on by secretions, can be removed, cleansed, and replaced, is firm and elastic, and adapts itself to the parts wherever applied.

Mydriatics and Myotics. **EUPHTHALMIN.** This drug is really a valuable addition to the list of mydriatics. J. Woskressensky⁵ concludes that it produces prompt mydriasis of short duration, causing very little weakness of accommodation, no increase of intraocular tension, disturbance of the corneal epithelium, or symptoms of irritation. H.

¹ Centralblatt f. praktische Augenheilk., February, 1899.

² La Clinique Ophtalmologique, October 10 to November 25, 1899.

³ Graef's Archiv. f. Ophthalmologie, October, 1899.

⁴ Ophthalmic Record, May, 1899.

⁵ Wochenschrift f. Therapie und Hygiene des Auges, No. 36, 1899.

Knapp¹ found that it produced maximum dilatation of the pupil in thirty or forty minutes, with so little impairment of accommodation that patients did not complain of it, and in five or ten hours the pupil returned to normal. In two cases he received the impression that it had a tendency to increase intraocular tension. But it does not irritate the conjunctiva or skin, and may be used as a substitute for atropia in cases of intolerance of that drug. J. Hinshelwood² reports that two or three drops of a 5 per cent. solution dilate the pupil fully in twenty to thirty minutes. The paresis of accommodation produced is very transient, passing off in two hours. There is no discomfort, irritation, conjunctival injection, alteration of the cornea, elevation of ocular tension, or toxic symptoms produced by it. The mydriasis disappears in eight to twelve hours. It approximates more nearly the ideal mydriatic than any other hitherto used. My own conclusions regarding it are:³ That it acts as a true mydriatic, more feeble and brief in its influence than homatropine. Its influence on accommodation is relatively slight, and causes but trifling annoyance. It has no practical value as a cycloplegic. It is the best agent to produce brief dilatation of the pupil in a strong light. Combined with cocaine, it produces satisfactory mydriasis for the examination of the eye, with the least annoyance to the patient and the most rapid recovery.

ARECOLINE, an alkaloid of the seed of the areca catechu, is brought forward as a valuable myotic by Chetwood-Aiken.⁴ Applied in $\frac{1}{2}$ per cent. solution its myotic action reaches its height in ten or twelve minutes, and lasts about one hour. It causes only a slight prickling sensation, no ciliary congestion or headache. Its action on the general system rather resembles that of pilocarpine.

Local Anæsthetics. ACIN was introduced by Trolldenier,⁵ who proved that it was less poisonous than cocaine, and that a concentrated solution dropped on the cornea of the rabbit caused anaesthesia that continued for "several days." Such a solution, however, was quite irritating. A solution of 1 : 100 caused anaesthesia lasting forty to eighty minutes, and one of 1 : 40 anaesthesia lasting one day. R. L. Randolph⁶ tried it on the human eye, and found that in solutions of 1 : 300 to 1 : 100 it produces anaesthesia in the normal eye about as quickly as cocaine, but in congested eyes repeated instillations did not produce satisfactory anaesthesia. It had no effect on the corneal epithelium, the accommodation, the size of the pupil, or the intraocular tension.

¹ Archives of Ophthalmology, May, 1899.

² Ophthalmic Review, November, 1899.

³ Ophthalmic Record, July, 1899.

⁴ British Medical Journal, January 14, 1899.

⁵ Therapeutische Monatsheft, January, 1899.

⁶ Ophthalmic Record, August, 1899.

Such solutions killed the *staphylococcus pyogenes albus* in twenty-four hours. The stinging produced by the instillation is greater than that produced by cocaine solutions.

The pain attending subconjunctival injections has been a serious obstacle to their employment, and the local anaesthetics heretofore employed were too brief in their action to greatly diminish this pain or too poisonous to be freely used. A. Darier¹ thinks that in acoin the ideal anaesthetic for this purpose has been found. This view is confirmed by R. B. Carter.² After cocaineizing the eye even large subconjunctival injections can be made without causing pain, either at the time or subsequently. The following formula was used :

Mercuric cyanide	1
Acoin	10
Normal salt solution	1000

Acoin is soluble in water to the extent of 6 per cent. Its solutions should be freshly prepared and kept from the light.

TROPACOCAIN is considered by R. Hilbert³ a very satisfactory anaesthetic for operations on the cornea, even for tattooing, and for iridectomy, but it produces less satisfactory anaesthesia of the conjunctiva. It is the opposite of cocaine in causing hyperæmia instead of anaemia of the tissues. The irritation produced by it is lessened by the addition of sodium chloride to its solutions. Hilbert uses the following :

Sodium chloride	1
Tropacocaine hydrochlorate	5
Distilled water	100

NIRVANIN has been put forward as a local anaesthetic, but Serini and Artault,⁴ from a study of its influence both on the rabbit and man, find that it is too irritant, and the anaesthesia it produces too fugitive and uncertain for it to replace other drugs of this class in ophthalmic surgery. Its solutions, also, rapidly become infected.

HOLOCAIN has already been referred to. (See Diseases of the Cornea.) It has been used by J. Hirschberg⁵ in many hundreds of operations, both major and minor, and in not a single case was any bad effect observed. The clouding of the solution in the bottle is said by H. Tauber to be due to the formation of a silicate. I have prevented this clouding in a bottle that previously caused it by rinsing it with dilute nitric acid and afterward with distilled water.

¹ *La Clinique Ophthalmologique*, June 25, 1899.

² *Lancet*, October 21, 1899.

³ *La Clinique Ophthalmologique*, August 10, 1899.

⁴ *Archives d'Ophthalmologie*, December, 1899.

⁵ *Centralblatt f. praktische Augenheilk.*, June, 1899.

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